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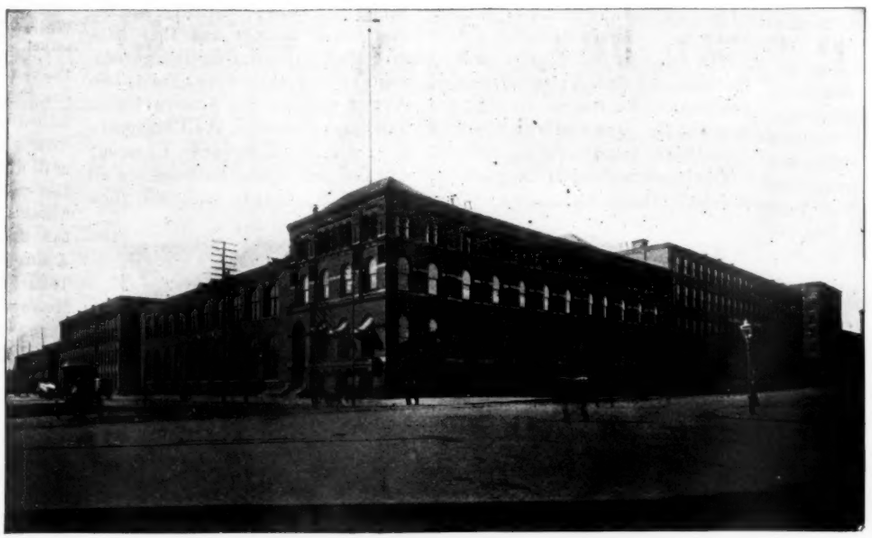
VIEWS, NEWS AND INTERVIEWS.

"Yes, I've been fishing," remarked Meekin, the lazy inventor, as he tilted his chair and lit his pipe, at the same time exhibiting a healthy coat of sun-burn to his envious listeners. "Have any experiences? Well, yes. For one thing, I struck an elegant crowd of liars all along the banks of the St. Lawrence. They'd lie even about the time of day. Familiarity with city fishermen causes it, I guess. I didn't mind it—felt quite at home. You fellows in the electrical business understand the feeling, I reckon.

"Did I invent anything while I was away? Well, nothing great. I did try to make bass fishing a little easier, though. You see, the bass were biting elegantly and they were as gamy as you could wish. Fact is, I got tired fighting 'em for half an hour at a time and I made up my mind that as when I went fishing, fish was what I wanted, I would find a way to get 'em into the boat without so much work. Yes. I know I'm lazy, but somehow I get there. Well, I thought if I could rig up a device to electrocute a bass as soon as he was hooked, I'd save myself a powerful lot of useless work. I got some batteries from the New York Central station agent at Clayton and there was a fellow down in the electric light station who lent me a big induction coil. I bought a spool of very fine copper wire and braided it in with my bass line. Then I rigged up the batteries and induction coil in the boat and fixed a switch so I could throw on the current by moving a lever with my foot. Mose, the guide, was a little fearful of the outfit at first, but he finally got accustomed to it.

"We started out one morning with our apparatus ready to send about 40,000 volts through any fool bass that tackled my hook. I cast out my line soon after we started and pretty soon felt a bass nibbling the bait. I gave him a little slack and then struck in the hook as hard as I could. I let him monkey around a little while just to give him a chance to escape an awful and certain death. Then I threw the lever with my foot and let him have the juice. Say, I didn't kill him for a cent. He liked it. That bass stood still in the water for a minute and then when he realized that he was getting a nice electric shock without any cost, absolutely free, he was the most joyous and frisky fish you ever heard of. He started out straight from the stern of the boat, turning somersaults for pure happiness. At every leap he'd make the old reel hum. I got tired and wished he'd break the line and get away and leave me alone. But no, sir, he was just having fun with me. Finally, I believe I'd have cut the line to get rid of him if I hadn't wanted to see the annoying critter. At last, Mose suggested that I shut off the current. I did. The bass sulked then and wiggled the line trying to show me that he wanted more. Presently he quit that and came in toward the boat. I reeled in the line and he came clear up and into the scoop not as easy as a little sun fish. When he got into the boat he flopped around until he had inspected the batteries, the coil and the switch. Then he heaved a sigh and died. I honestly think that the only reason that bass gave up was to get into my boat and see what it was that gave him such delightful sensations."



FRONT VIEW OF THE OFFICE AND SHOPS OF THE BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA.

A pretty shade for incandescent lamps may be easily made by removing the stick from a doll's Japanese umbrella and fitting the latter snugly over the lamp. Another tasteful shade is a pond lily made of crêpe paper.

The New York *Evening Sun* asks the following question, but wisely refrains from attempting to answer it:

Why is it that, whereas only three of the seats in open street cars are reserved for smokers, women will persist in sitting in them, while others are empty forward?

THE BALDWIN LOCOMOTIVE WORKS.

A PLANT WITH A CAPACITY OF ONE THOUSAND LOCOMOTIVES PER YEAR.

In view of the working combination entered into between the Westinghouse Electric and Manufacturing Company and the Baldwin Locomotive Works, of Philadelphia, as announced last week in the ELECTRICAL REVIEW, a brief description of the latter's immense plant will prove interesting.

The works, which were founded early in the century, are operated by Burnham, Williams & Company, the members of the firm being George Burnham, Edward H. Williams, William P. Henszey, John H. Converse and William L. Austin. The company, it is understood, has never been incorporated and represents a capital of about $5,000,000. The accompanying illustration gives a front view of the company's office and shops. While this illustration is more accurate than any birdseye view could be, it does not give an adequate idea of the size of the works. They are centrally located near the middle of the city of Philadelphia, within five minutes' ride of the Philadelphia & Reading terminal and the Pennsylvania Railroad station. The buildings, 24 in number, occupy 16 acres, covering most of the space bounded on the south by Pennsylvania avenue, on the north by Spring Garden street, east by Broad and west by Eighteenth street.

The following statistics of the Baldwin Locomotive Works give an idea of the immense business handled by them:

Number of engines built per day, 3⅓; capacity per year, 1,000; num-

ber of men employed, 5,100; hours of labor per man per day, 10; principal departments run continuously, hours per day, 24; horse-power employed, 5,000; number of dynamos for furnishing power to drill presses, punching machines, shears, cranes and for lighting, 26; number of electric lamps in service, 3,000; consumption of coal in net tons per week, approximately, 1,000; consumption of iron in net tons per week, approximately, 1,500; consumption of other materials in net tons per day, approximately, 40; capacity of erecting shop with 19 tracks, capable of accommodating four engines per track, 76; lifting capacity of electric cranes, each, tons, 100; lightest engine built, 5,100; heaviest engine built, 195,000.

Brooklyn Real Estate Men and the Trolley.

Since the trolley cars in Brooklyn have been reducing the population of the city to such an alarming extent, real estate men have had considerable difficulty in persuading people to move from this city over the bridge.

They are beginning now to offer prizes of all sorts as inducements to desirable tenants. Some agents allow the occupants of their property car fare to and from business, while others pay the premium on their fire insurance, etc.

The following advertisement from a morning paper, however, is considered the top notch reached thus far by the enterprising agents employing the prize method as a decoy for the inexperienced house-hunter:

"Five rooms and a bath in good neighborhood; shades, curtains and carpets free; in first-class order and condition; 18 minutes to New York City Hall; one month's rent free and diamond cluster ring will be given to good tenant.—Lexington avenue, Brooklyn."—*New York Evening Sun.*

Write to the Various Electrical Manufacturing Companies.

To the Editor of Electrical Review:

Will you please inform me where I can send my son to become an apprentice to learn all the branches of electrical engineering? He wants to become an electrical engineer. He is 18 years old, 5 feet 10, weighs 168 pounds. Has a good knowledge of same. He has wired houses with electrical bells and burglar alarms. He is a good mathematician; got a gold medal for same. He takes deep interest in electricity, and I want him to become an electrical engineer. Do not believe in schools, but get him into a factory and get right down to practice and not theory. He is not afraid of work. Your assistance in this matter will be kindly appreciated. Would like to have your views upon this matter. He can furnish the best of reference. Was born and raised in this city. Awaiting a reply,

Yours respectfully,

M. J. Jacob.

Brenham, Tex., August 3.

A Boston Electrical Outing.

The Thompson-Brown Electric Company, of Boston, gave their first annual outing to their friends in the trade on Tuesday, the 6th inst., and in response to their invitation about 100 good fellows boarded the steamer "Surf City" in the early morning for a few hours' deep-sea fishing and a run up the North Shore.

The start was made at 8.30, and the trip down the harbor was enlivened by good music and plenty of refreshments for the inner man.

The fish were found to be sociably inclined, and quite a number boarded the steamer for the return trip, the first and the largest of which were of considerable value to their possessors.

This important matter being settled, a delightful run along the coast was next in order, and the party left the boat in the evening with many congratulations to their hosts for the very pleasant day afforded them.

A London contemporary reports that arrangements for the establishment of telephonic communication between Brussels and Antwerp on the one side and Cologne and Aix-la-Chapelle on the other are now said to be practically completed.

THE UNDERGROUND ELECTRIC RAILWAY AT WASHINGTON, D. C.

BY GEORGE C. MAYNARD.

For 20 years and more, the legislative branch of the United States Government has been passing laws prohibiting the use of poles and overhead wires in the streets of this city and the executive department has been trying to enforce these laws.

Fig. 1.—Power Station No. 1, Metropolitan Street Railroad, Washington, D. C.

During this time the electric companies have been persistently resisting every such attempt and they have succeeded in defeating the government oftener than they have failed. At this moment the Western Union Telegraph Company, the Chesapeake & Potomac Telephone Company and the Eckington Railroad are all engaged in a fight to maintain poles which have been ordered down, and the chances are that they will gain their point.

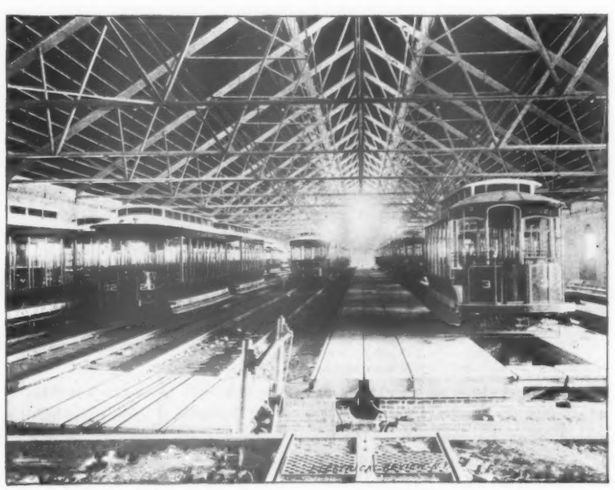


Fig. 2.—Car House, Metropolitan Street Railroad, Washington, D. C.

The course of the Metropolitan Street Railway in dealing with this question has been a notable exception to the custom. The last Congress passed a law declaring that it should, before the first day of August, 1895, have in operation on its Ninth street line a subway electric system. The president of the company, Mr. Samuel L. Phillips, after a hasty and intelligent survey of the situation, responded "*It shall be done.*" Three days before the time expired he issued an invitation to the district commissioners and other prominent officials, the president of the Board of Trade, the officers and engineers of numerous street railways and others especially interested in the subject, to inspect the plant and go on the first trial trip over the line. Every seat on the train was occupied and the platforms were crowded.

The trip was too monotonously successful to afford anything for interesting description. There was simply a smoothly running electric train without the bothersome broomstick attachment. All the machinery was new and untried, the grooved track was very dirty, the conductor bars and contact shoe had all the scale, rust and roughness of new cast-iron, but the train pursued its way over its eight-mile course without interruption or difficulty.

Among the passengers were many men of experience and critical judgment in such matters, and the unanimous opinion was that the practicability of underground electric traction was fully established.

The especial significance of the event lies in the fact that the undertaking was inspired and made possible by the skill, the enterprise and the foresight of the General Electric Company, which, while booming the trolley and building roads by the thousand miles, clearly comprehended the fact that the time in which rapid transit in large cities could be maintained to the detriment of all other interests must necessarily be short and did not neglect to prepare for the change now fairly inaugurated, which will relegate overhead wires to the suburbs and country towns. A shrewd and experienced capitalist declared that the running of this Metropolitan train ought to advance the company's stock 10 points.

When the train returned to the power station the president promptly issued an order to send out, for regular service, all the trains they could man. Since that day the number has been steadily increased as fast as men could be trained to run them and by the time this report is in print the last horse car will be withdrawn.

This line embraces all the serious elements of railroading. It has long and heavy grades, many sharp curves and numerous crossings of steam and street roads, while the cars of several other companies run on its tracks for short distances. It intersects some of the busiest and most crowded sections of the city where travel will be irregular and very heavy. It runs along half a mile of river wharves where shiploads of passengers are unloaded at all times of the day and night. It passes the Pennsylvania Railroad station, the Center Market and other crowded localities where the capacity of the service will be greatly taxed.

To meet these demands the company is well prepared. The road, in

construction and equipment, is the best in the District of Columbia. There is nothing experimental or temporary about it. Durability and permanency is evident in every detail. Not a dollar has been expended for show, thousands have not been withheld where needed to perfect the plant. The details of the construction were described in the ELECTRICAL REVIEW some months ago and need not be repeated.

The car barn is a splendid structure with room for 150 cars. The station is equipped with three independent power units—Corliss engines and General Electric generators—each of sufficient capacity to run the entire stock of the Ninth street line, which now comprises about 15 trains of two cars each. Another generator will operate the eastern half of the main line and the third will meet any emergencies. All the station buildings are lighted by arc and incandescent lamps operated by a special engine and dynamo.

The reconstruction of the main line, for which another year is allowed, has already been commenced—the first line in successful operation and the second in the hands of the builders affords an object lesson which will be studied. Managers of existing and projected roads, as well as municipal authorities throughout the country, have been watching this enterprise with great interest, prepared to profit by the results, and there is every prospect that numerous other subway roads will shortly be under way.

Baltimore-Washington Electric Railway.

It was announced last week that contracts had been awarded for the construction between Baltimore and Washington of the Columbia & Maryland Electric Railway, in which Messrs. Widener and Elkins, of Philadelphia, are interested. It is said that high speed passenger trains will be run over the road, which is to be completed within a year.

The contract for the construction has been awarded to E. D. Smith & Company, of Philadelphia, who are to build a double-tracked road with steel rails weighing 85 pounds to the yard. Heavy masonry bridges are to be constructed, and the whole road will be equipped as substantially as a steam railroad. The firm is also to build a branch road from Baltimore to Ellicott City, Md., a distance of about 10 miles. The aggregate cost of construction of both roads will be nearly $3,000,000. There are to be two power stations, one on the Patapsco River and the other at Laurel, Md. The contracts for the overhead construction of the road and the equipment with rolling stock have not yet been awarded.

Fast time is to be made by express trains, and the terminal facilities in both cities will be ample for a heavy traffic. The site for the Baltimore depot has been selected in the heart of the city, midway between the railroad stations.

TELEPHONE NEWS AND COMMENT.

All overhead wires in the business section of Indianapolis, Ind., must go underground.

The New England Telephone and Telegraph Company has secured 25 subscribers at Easthampton, Mass., and will soon establish an exchange there.

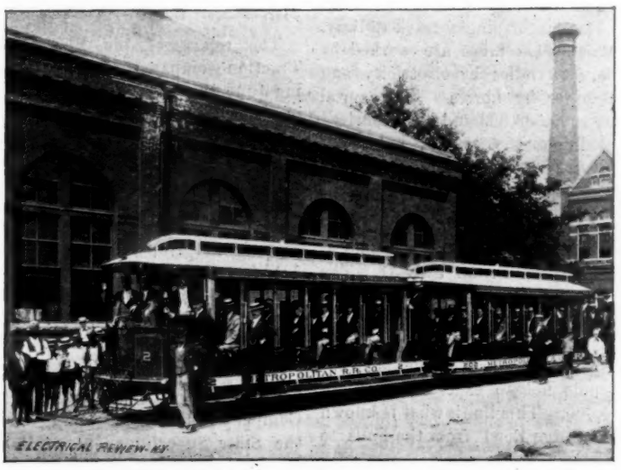


FIG. 3.—CARS ABOUT TO START ON FIRST TRIP ON THE UNDERGROUND ELECTRIC SYSTEM, METROPOLITAN STREET RAILROAD, WASHINGTON, D. C.

The Common Council of Haverhill, Mass., has refused to allow the New England Telephone and Telegraph Company to put its wires underground in that town.

The Southern Massachusetts Telephone Company has begun the work of laying its wires underground in Fall River, Mass. Several years will be required to complete it.

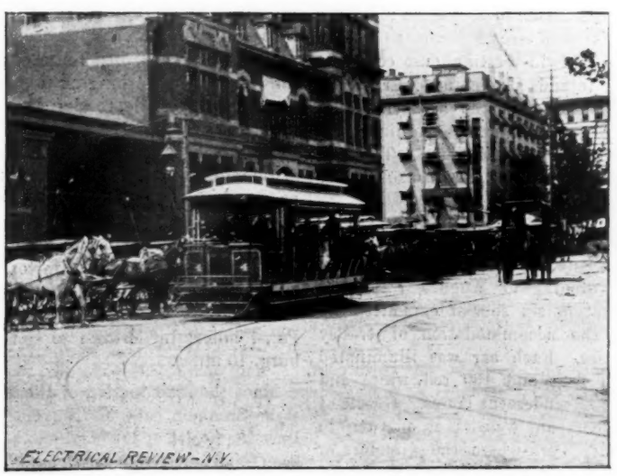


FIG. 4.—CAR OPERATED ON THE UNDERGROUND ELECTRIC SYSTEM PASSING PENNSYLVANIA RAILROAD STATION, WASHINGTON, D. C.

Though Mayor Pingree, of Detroit, approved the Harrison Telephone Company's ordinance on July 31, the officers of that company do not as yet seem to have made up their minds to do business under its terms.

The plans for the underground conduits to be constructed in Toledo, Ohio, by the Central Union Telephone Company have been completed and submitted to the city authorities and approved by City Engineer Clark and City Electrician Green.

The metallic circuit between Montpelier and Cabot, which the Vermont Telephone and Telegraph Company is putting in, is in working order as far as East Montpelier, and will soon be completed the entire distance.

The Hudson River Telephone Company's directors declared the regular quarterly dividend of three-quarters of one per cent last week. The directors decided to build an entire new line from Glens Falls to Whitehall, N. Y., a distance of over 20 miles. A new line between Hoosick Falls and Bennington, Vt., has just been finished.

Since the Hudson River Telephone Company decided to extend the long-distance service to Whitehall and Rutland, a plan is on foot to build a new line from Whitehall to Montreal. Among the chief promoters of the plan are Hon. H. G. Burleigh and Smith M. Weed, who have large interests in the northern part of New York State.

A blow was recently struck in Wichita, Kas., at the Missouri & Kansas Telephone Company by the City Council. The company refused to reduce the monthly tolls and the Council imposed a license tax of $10 per month on each telephone, and passed an ordinance imposing $100 fine on any person using a telephone until the company pays the tax.

Speaking of the recent voluntary reduction in rates by the Southern New England Telephone Company, the Hartford *Courant* says: This means that for from 10 cents to 13 cents a day the householder of the year 1895 can have in his house a convenience of such a nature that, if in 1875 he had claimed to have it in his house or to be about to have it, he would have been shut up in a retreat.

The telephone, it is said, is not making much progress in Russia. And no wonder! Fancy a man going to the 'phone and shouting: "Halloa, is that you, Dvisostkivchsmartvoiczski?" "No, it's Zollemschouskaffirnocknstiffsgowoff, who's speaking?" "Sezimochockiertrjuaksmzyskischokemoff. I want to know if Xliferomanskefflskillmajuwchzvastowskaweibierski is still stopping with Dvisostkivchsmartvoiczski." — *The Katipo.*

Mr. Fred B. Hubbell, of Baltimore, has been elected president of the Home Telephone Company, of Baltimore, in place of Mr. Franklin Noble, of New York. This makes the management of the company entirely composed of Baltimoreans. The company now has contracts with 5,400 subscribers. The specifications for the construction of its system have been placed in the hands of bidders, and the contract, it is reported, will be let in a few weeks.

It is reported that both the New York Central and the Pennsylvania railroad officials are investigating the merits of telephone systems with the idea of placing speaking apparatus in the several stations of their block system, and also of substituting telephones for the electric bells now in use on the limited express trains. With a telephone, instead of a push button at each seat, the modern traveler will be able to make his wants known with little trouble either to himself or to the train employés.

The Elizabeth Mutual Telephone Company, of Elizabeth, N. J., was recently forced out of existence by the New York & New Jersey Telephone Company, whose counsel served a writ on it restraining the company from building its line on the ground that it had not been properly organized under the telephone law. The only alternative was for the company to reorganize and drop the word Mutual, which has been done. The reorganized company is called the Elizabeth Telephone Company and the officers are William H. Rankin, president; Peter Egenolf, vice-president; Charles N. Trumble, secretary, and Robert W. Waterbury, treasurer. The same directors were chosen that the Elizabeth Mutual Telephone Company had. The company expects to have its system in operation before October 1.

ELECTRIC RAILWAY NOTES.

Work on the trolley road has begun at the Terrace in New Brighton, Staten Island.

The electric railway system at Brattleboro, Vt., is now in operation. Westinghouse equipment is used.

The pending consolidation of the Pittsburgh street railway lines is temporarily interfered with, apparently, by politics.

Street railway securities ought to be a good investment, if there is any value in the abundance of them.—*New York Journal of Finance.*

Proceedings will be commenced in the United States Court in Milwaukee soon to have the order of Judge Jenkins, appointing receivers for the Milwaukee Street Railway Company, set aside on the ground of fraud.

James Spratt, a Newark truckman, was fined $10 in a Jersey City police court on August 6 for obstructing electric cars. Spratt got his truck on the car track and drove leisurely ahead of a procession of several cars for a mile and a half before he was arrested.

The Pennsylvania Traction Company, of which ex-Senator John J. Patterson was president, and which contemplated building a trolley line from Harrisburg to Philadelphia, has abandoned the scheme, it is said, owing to the Supreme Court's decision defining the electric railway privileges.

Since the application has been made for a receiver for the New York & New Jersey Traction Company, which planned to run through Plainfield, N. J., there is a strong probability that the Consolidated Traction Company, now operating between Elizabeth and Newark, will extend its lines from the former city to Plainfield.

It is reported that for four months to date the West End Street Railway Company, of Boston, has earned all its charges for the half year, four per cent on the preferred stock, four per cent on the common stock, all construction charges and $100,000 besides, and has still the months of August and September to swell the surplus accumulation.

The Plymouth, Penn., trolley war was terminated on July 31, when representatives of the Norristown and Chestnut Hill and the Schuylkill Valley Traction Company went before Judge Weand with resolutions adopted by the township supervisors, withdrawing the proceedings instituted in the name of the township against the Chestnut Hill company.

The Toronto, Canada, Railway Company, which operates by electric power the only street railway in Toronto, has issued £323,000 of first mortgage 4½ per cent sterling bonds. Of this amount £250,000 was issued in Canada and the remainder in London. The subscription lists closed in Toronto on August 2, when about £150,000 had been subscribed.

The Pennsylvania Railroad officials are said to be considering the advisability of using the trolley system from Mt. Holly, N. J., to Camden, N. J., a distance of 14 miles. The new road to Burlington, which was an experimental venture, is said to be highly successful and profitable, and it is said that in the near future steam will be abandoned on all the branch roads.

The Metropolitan Street Railway Company, of Kansas City, now owns 114.1 miles of single track railway, of which 61.5 miles are worked by cable, 39.8 miles by electricity and 12.8 miles by horses. The capital stock is $5,586,800 and its authorized funded debt is $8,500,000, of which about $1,000,000 is to remain in the treasury for future requirements.

A mortgage for a large amount was filed at the County Clerk's office at Lockport, N. Y., on July 31. The Niagara & Lewiston Electric Railroad Company gives the Knickerbocker Trust Company, of New York, the mortgage to guarantee the payment of bonds not to exceed the sum of $700,000. This line is what is known as the Gorge Road from the Falls to Lewiston.

Suit has been begun in the Supreme Court by the Brooklyn Heights Railroad Company against the city of Brooklyn to have the speed ordinance, limiting the running of cars to six and eight miles an hour, declared invalid and void. Summons and complaint in the suit were served on Mayor Schieren on August 1, and the defendant's answer is returnable within 20 days.

Draughtsmen at the Baldwin Locomotive Works, in Philadelphia, are said to be busy working upon plans for the trucks to be placed upon the new type of electric locomotive which the Baldwin-Westinghouse combination intends producing. Mr. Westinghouse is quoted as saying that there is nothing new concerning Manhattan Electric contract. The new electric locomotives will probably be ready in three weeks.

The Brooklyn Heights Railroad Company, of Brooklyn, N. Y., on the evening of August 7 put in operation six special cars fitted up for the accommodation of trolley parties. Each car was illuminated with flags and 100 red, white and blue incandescent lamps. Guests of the company were taken on a trip to Ulmer Park where the directors of the road provided a banquet. About 300 persons rode on the six cars.

At a meeting of the Bridgeport, Conn., Common Council on August 6, City Attorney Toomey presented a report of an investigation of the city's relations with the Traction Company and recommended that a committee be appointed to learn if possible why the street railway was not built according to specifications. The report criticises several ex-city officials and the electrical expert in the employ of the city at the time the lines were being constructed.

Last week Mayor Strong, of New York city, signed the resolution of the Board of Aldermen providing for the sale of the extensive railway franchise in the section above the Harlem River, asked for by the People's Traction Company. The franchise, which must be sold at auction to the highest bidder, provides for an extensive system of lines which will probably be operated by the trolley system and will cover about 27 miles of the streets in the 23d and 24th wards.

The report of the Philadelphia Traction Company for the year ending June 30, 1895, makes the following showing: Gross, $5,662,051; expenses, $3,540,837; wages, about $1,500,000; damages to people injured, $318,762; company paid in the year, $1,000,000 in dividends; operates 203 miles of road; passengers carried, 111,475,982; transfers, 38,721,208; capital stock, $30,000,000, of which $15,300,000 has been paid in and $20,000,000 subscribed; bonded debt, $1,053,000, and unfunded debt, $1,089,000.

The Cataract General Electric Company on August 6 applied to the State Superintendent of Public Works for permission to experiment with a new system for towing boats on the canals by electricity. The test will be made September 25 on the Erie canal for a distance of four miles between Buffalo and Tonawanda. Current will be furnished by the Niagara Power Company. The experiment will be made on a four-mile section of the canal, upon which are overhead bridges and sharp curves, in order that the system may be fully tested.

It is said to be the belief in Baltimore that the proposed electric railway from Washington, D. C., to Gettysburg, Pa., will become a reality. The proposed route of the railway is from Washington to Sandy Spring, to Sykesville, to Westminster, to Union Mills, to Littlestown, Pa., to Gettysburg. The distance from station to station, according to the proposed route, would be as follows: Washington to Sandy Spring, 11 miles; Sandy Spring to Sykesville, 17 miles; Sykesville to Westminster, 15 miles; Westminster to Union Mills, 6 miles; Union Mills to Littlestown, Pa., 7 miles; Littlestown to Gettysburg, 10 miles.

Since the introduction of the new-style Summer cars on the electric lines the health of the conductors has been constantly menaced, says the Baltimore *News*. Holding on to the brass handles so much while on the footboards has proved injurious. They are almost constantly on the footboards, and their hands are often literally plated with brass on the inside from grasping the handles. Frequent and bad sores are the result, when the hand is pimply, and time is lost by the sufferer in consequence. A Green line conductor says that he has lost 30 days on account of sore hands. He says several conductors of the same line are suffering in the same way. A few of the cars have wooden handle bars, and the men are hoping they will be put on the others.

Philadelphians have two amusements now. One is the trolley party and the other is the Zoölogical Garden at Fairmount Park, says a writer in the New York *Sun*. The greater of these is the trolley party. This may be because trolley cars are swift. They provide an absolute change from the ordinary life of the town. Beer and a brass band accompany trolley parties. When a steep down grade is encountered the conductor shouts, "Three minutes in the tunnel!" Then he pulls down the trolley pole. The lights go out. The motorman lets go the brakes, and the car shoots down the hill at a mile-a-minute gait. The darkness enables the young men to steal kisses unseen. The rides down hill are called "shooting the chutes." There have been no accidents yet, but there will be some day.

The electric locomotive is now drawing all east-bound freight trains through the Baltimore Belt Line tunnel. In a few days the motor will begin test trips with passenger trains. This will be a test of speed rather than of strength. Mr. L. H. Parker, of the General Electric Company, has reported the time of the motor in running through the tunnel with three empty freight cars to be about two minutes and ten seconds. The tunnel is about one and four-tenths miles long, and the time was, therefore, at the rate of nearly 40 miles an hour. The west-bound freight trains will not be hauled by the motor, but be allowed to run through by their own momentum, as the tunnel is down grade from north to south. Later all hauling will be done by the motor now in use and the two in course of construction. The latter will be completed in about six weeks.

An important and enthusiastic meeting was held recently at the office of Hon. Wilmot M. Smith, County Judge of Suffolk county, N. Y., composed of many prominent men connected with the proposed electric trolley railroad from Patchogue to Port Jefferson. Letters were read from several prominent business men in the electrical and engineering line favoring the road and offering to give it their aid. The road will be built from Patchogue on the Great South Bay, passing through the principal streets of that town and running thence through the villages of Medford, Farmingville, Selden, Terryville and through the main thoroughfares of Port Jefferson to the Long Island Sound, a distance of 14 miles, and connecting with a fast line of steamers for Bridgeport, New Haven and other towns on the Connecticut shore. The company proposes to capitalize at $200,000 and to commence work as soon as the preliminary arrangements can be effected and, in the meantime, the company will be open to negotiate with reliable firms through Secretary J. B. Swezey, of Patchogue. This road will be the first railroad across Long Island within 30 miles of the aforesaid places.

Professor Thomas's Incandescent Lamp Tests.

Prof. Benjamin F. Thomas, of the Ohio State University, Columbus, Ohio, has recently completed an elaborate series of tests on the "Packard" incandescent lamp, made by the New York & Ohio Company, of Warren, O. The report of the test is lengthy, and the following is a brief abstract of it:

The tests were very carefully conducted, Weston measuring instruments and a Summer-Brodhun sighting box adapted to an accurately graduated portable photometer bar 100 inches long being used. The results of the tests, showing the average of Lot No. 1, are given in the following tables:

Hours From Start of Test.	Number of Lamps Burning.	Candle-Power.	Per Cent of Initial Candle-Power.	Watts Per Lamp.	Watts Per Candle-Power.	Candle-Power Per Watt.
0	25	15.54	100	61.00	3.93	.254
96	"	17.58	113.2	63.12	3.59	.279
144	"	17.84	115.0	63.62	3.57	.280
192	"	17.82	115.0	63.54	3.57	.280
252	"	17.53	113.0	63.55	3.63	.275
312	"	17.30	111.4	63.41	3.66	.273
360	24	17.04	110.0	63.30	3.70	.270
408	"	17.08	110.0	63.30	3.70	.270
480	"	16.68	107.5	63.00	3.88	.265
528	"	16.70	107.5	62.73	3.76	.266
600	"	16.35	105.3	62.64	3.83	.261
648	23	16.07	103.4	62.60	3.90	.256
696	22	15.83	102.0	62.60	3.95	.253
768	"	14.81	93.3	61.94	4.17	.240
812	"	14.50	93.3	61.51	4.24	.236

ECONOMIC RESULTS.

Hours From Start.	Total Candle-Power Hours.	Total Kilo-watt Hours.	Total Cost of Light.	Average Cost in Cents of One Candle-Power Hour.	
100	41.500	155.25	$36.05	.0869	Cost of light based on assumed price of 30 cents per lamp, and 20 cents per kilowatt hour. Figures in last column obtained by dividing cost in fourth column by corresponding figures in second column.
200	89.950	314.00	67.80	.0754	
300	133.870	472.80	99.56	.0744	
400	175.930	628 0	130 60	.0742	
500	216.470	779.3	160.86	.0743	
600	256.090	929.9	190.98	.0746	
700	292.100	1071.2	219.24	.0751	
800	325.500	1207.7	246.54	.0757	

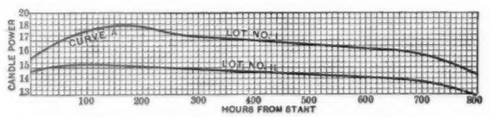
The electric readings were taken by two experienced students, Messrs. A. H. Jones and R. D. McCarter, Jr. One hundred lamps labeled "16 candle-power 100 volts" were obtained for this test. They were about equally divided in two lots, having distinguishing marks inside the bulbs. Twenty-five lamps were taken at random from each lot for test.

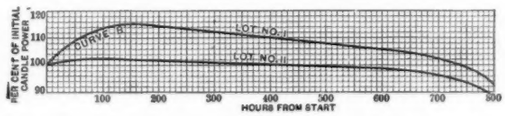
The voltage was not perfectly constant, and no attempt was made to secure unusual constancy, for the reason that the circuit arrangement used enabled us to work the lamps under the conditions ordinarily existing in central station practice. The results may, therefore, be considered as a better indication of what lamp users may reasonably expect from similar lamps, than if the lamps had been run at an unvarying voltage. From readings taken on different days and at different times of day, I think the average voltage was about 99.

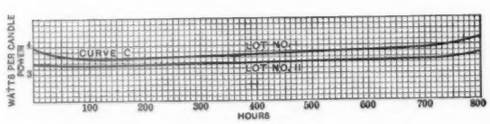
600 hours, when a more rapid decrease sets in. The candle-power does not fall to its initial value of 15.54 candles until over 700 hours from the start. Lot II shows only a moderate rise in candle-power with a maximum at about 150 hours, and then decreases uniformly to its initial value at 400 hours. It shows also a sharp increase in declining brightness at 600 hours. This change may have been produced by strain due to abnormally high voltage at soon after the 600-hour point. Such a high voltage was observed for some time during the day preceding the evening on which the readings at 696 hours were taken. Curve C shows a marked increase in efficiency for Lot I on the start, falling back to the initial value only after 600 hours. Lot II improves in efficiency also at the start, though to a smaller extent, and continues at a practically uniform figure for 600 hours. The decrease in efficiency for each lot after 600 hours is much less rapid than usually met with.

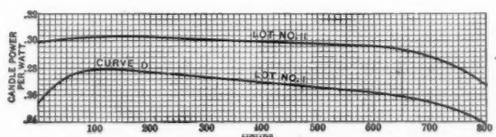
It will be noticed that the breakage is remarkably small. No lamp of either lot showed any serious blackening, and the majority of the lamps were scarcely blackened at all.

The report ends by saying that taking economy, maintenance of candle-power and freedom from blackening into account, the results obtained are much superior to any heretofore published, and the New York & Ohio Company, of Warren, Ohio, whose lamp, the well-known "Packard," was used in this test, are to be congratulated upon their achievement in the manufacture of incandescent lamps.









The values of tables I and II (the first is the only one given here) are plotted in terms of candle-power and time in curve A, of percentage of initial candle-power and time in curve B, and of efficiency and time in curve C. As shown by these curves, Lot I shows a marked increase in candle-power on the start, reaching a maximum of 17.9 candles at about 175 hours, then decreases uniformly until

Telephone Protective Association.

The Executive Committee of the Telephone Protective Association met at the Hollenden Hotel, Cleveland, on Friday. Discussion was held with reference to the Bell suit at Boston, but as the National Telephone Company is not a member of the association, it was decided not to take action in suit further than to send an attorney to Boston to determine what measures should be adopted.

AMERICAN BELL SUES THE NATIONAL TELEPHONE MANUFACTURING COMPANY.

THE TELEPHONE SITUATION IN BOSTON.

On Tuesday, the 6th inst., the American Bell Telephone Company brought suit against the National Telephone Manufacturing Company, of Boston, for infringement under the Berliner patent.

This action of the Bell company came as a total surprise to the trade at large, as it was the general opinion of those best qualified to judge, that in spite of the recent decision of the United States Circuit Court of Appeals sustaining, or rather, refusing to annul, the Berliner patent, it was far too weak a case to bring before a Circuit Court with a view to obtaining an injunction against a competing company. It was generally thought that the Bell company would prefer to hold the matter open, using the Court of Appeals's decision as a menace to intimidate the smaller companies, and possibly scare some of them out of the field, rather than bring to an issue a question in which the chances were against them.

So very general was this view of the case that when the news of the suit having been brought was first spread, the only cause assigned for such action on the part of the Bell company was the belief that the National company had been bought up in order to allow the Bell company to obtain an injunction and so strengthen their position before the Supreme Court. So deeply were some of the leading telephone people in New York impressed with this idea, that their representative, who, by the way, is a prominent member of the bar, made a flying visit to Boston in order to ascertain the facts, and acknowledged that this was the only ground on which the action of the Bell company could be understood, so small was their chance of winning under any other circumstances.

Whatever the idea of the Bell people may be, the National company is prepared to contest the suit, and will do so in the strongest possible manner. Now that the die has been cast, and the vital question of whether or not the vast telephone interests of the country shall be in the hands of the Bell company for another 17 years is at issue, it may turn out that other large interests will be drawn into the case, as in the Bate refrigerator suit, and that the National Telephone Company will find itself backed up and surrounded by the most eminent counsel in the country. The present issue is one of far-reaching importance, and before it is settled may turn out to be the biggest legal battle of the century.

One thing is certain, the National Telephone Company will not be allowed to carry on the fight unaided, and it would be no surprise to those familiar with the inside working of affairs, to find the Bell company confronted with an antagonist of equal power, and one whose prestige would not suffer by comparison.

There is no doubt that the sentiment of both press and public is strongly against the Bell company, and the judge who will grant an injunction on the strength of the Berliner patent, or rather the shreds that are left of it, and in advance of the decision on the government's appeal to the Supreme Court for its annulment, will be a man of phenomenal nerve, to say the least.

The end is far off at present, and before that end is reached, some surprising developments may be looked for. In the meantime let the progress of the past year continue, and the demands of the public be supplied.

H. G. T.

Boston, August 10.

Bids for Incandescent Lamps.

WASHINGTON, D. C., August 6, 1895.—Bids were opened to-day at the Bureau of Supplies and Accounts, Navy Department, for a quantity of supplies for the New York Navy Yard, N. Y., as follows:

Three thousand incandescent electric lamps, 10 candle-power, plain; 7,000 incandescent electric lamps, 16 candle-power, plain; 600 incandescent electric lamps, 32 candle-power, spiral filament.

All lamps shall be 80 volts. Their rated candle-power shall be the mean horizontal candle-power and, when new, the rated candle-power must be given between the limit of 78 and 82 volts, no fraction of a volt either below or above those limits being allowed. Their efficiency measured at their rated candle-power, when new, shall be $3\frac{3}{10}$ watts per candle-power, and shall not vary more than $\frac{5}{10}$ of a watt on either side of this standard. All lamps must be of the best quality and finish; the bulbs must be uniform in size and of the same dimensions for 10, 16 and 32 candle-power. The maximum dimensions allowable are: Extreme length, including base, five inches; extreme diameter, $2\frac{5}{8}$ inches. All lamps to have the Edison standard base, and they must be strictly interchangeable in all standard sockets. Each lamp must be marked on the inside of the bulb, with the date of manufacture, to give this candle-power. Delivery to be made at the navy yard, New York, within 60 days from the date of contract, but one-tenth of the lot shall be delivered within 15 days from the date of contract. The lamps to be put in standard commercial packages. The bidders were as follows:

Columbia Incandescent Lamp Company, $2,210.

Earnest A. DesMartes, $2,304.

The Buckeye Electric Company, $1,900.

International Trading and Electric Company, $2,298.

Universal Electric Company, $3,515.60.

Beacon Lamp Company, $1,695.

Bryan-Marsh Company, $3,476.

Manhattan Electrical Supply Company, $2,718.

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, AUG. 14, 1895.

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The interest of steam railroad men in electric traction is steadily growing. This is wisdom.

We regobbed our freds nod to sid too near a fad modor. The breeze is apd to give one a code in the head.

The Police Commissioners of New York city, now that they have called electricity to their aid, may be expected to come out victorious in all their efforts.

Storage batteries are again gaining ground. The ELECTRICAL REVIEW confesses to a considerable affection and faith for this branch of electrical development.

We trust the war of words between a great physicist of the United States and a distinguished electrician of Great Britain is over. These able men should not disagree.

It is reported that Mr. John Jacob Astor is contemplating a venture in electric yachts that will more than ever emphasize the adaptability of this new power for such work. Marine electric propulsion owes a great deal to this wealthy and progressive gentleman.

We believe more electrical people ride bicycles, proportionately, than any other industrial class. This is one of the things that manufacturers should note, and several have, as their announcements in the ELECTRICAL REVIEW prove. The successful electrician moves rapidly—hence the electrical demand for the swift bicycle.

THE WESTINGHOUSE-BALDWIN ALLIANCE.

The manufacturing agreement entered into between the Westinghouse company and the Baldwin Locomotive Works, as announced in the ELECTRICAL REVIEW last week, is a most admirable arrangement for both the companies interested and for the development of high-speed electric traction on steam railways. This development will be greatly hastened by this means and when we consider the talent and experience controlled by the combination we look into the future of this branch of electrical work with renewed confidence. The arrangement is in no sense a consolidation of the two companies; they have simply agreed to manufacture electric locomotives jointly, the Westinghouse company furnishing the electrical equipment and the Baldwin Works making the running gear and other mechanical parts.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The general stock and bond markets during the week up to Friday afternoon were exceedingly quiet. This was due to apprehension caused by the exchange situation. The resumption of gold exports was regarded as *prima facie* evidence that the bond syndicate, which since the first of April has prevented gold exports, had reached the end of its tether. This, coupled with important sales in this country for European account of government bonds rendered monied interests apprehensive. On Friday, when it was semi-officially stated that the syndicate would make good to the government any gold withdrawn for exports by deposits in exchange for greenbacks, there was a complete reversal of sentiment and prices sharply recovered from the decline of the early week.

In electrical stocks General Electric was the feature of interest and leader in activity. The quotation on Monday was 35⅞. On Wednesday a sharp demand developed carrying the price from 36¾ to 38⅜. On the subsequent day the stock opened at 38½ and sold down a point. On Friday it lost another point and then recovered in the general rally of the afternoon. It turns out that there is more basis for the buying than was at first supposed. It is upon knowledge that negotiations with Westinghouse are to be renewed. It is thought that a combination of some sort is among the probabilities. In this connection I hear a report, for which I will not vouch, that the company will secure the Manhattan contract with the tacit consent of Westinghouse, and that this latter concern will not lose on the award. The sharp advance in Manhattan, coincident with the buying of Metropolitan Traction, is thought to foreshadow an alliance between the latter company and the Morgan interest in Manhattan, which will result in decided advantage to the General Electric Company. It caused a revival of old stories that the Morgan influence in General Electric from this out will not only be a dominating one, as has been the case for the past two years, but that a personal supervision by that capitalist will be exercised over the General Electric Company. The persistency of reports regarding a deal with Westinghouse, in view of the relations of Mr. Morgan and Mr. Belmont, carry with them considerable conviction. The deal between the Westinghouse and the Baldwin Locomotive Works was thoroughly canvassed by the street and the conclusion reached that while it will prove an excellent hit for the two companies it will not hurt General Electric. I asked Geo. Westinghouse, Jr., as to its significance. He said that it was simply an arrangement calculated to work advantageously to both interests. The deal is operative and draftsmen are now working on plans for the trucks to be used by the new type of electrical locomotives.

The construction will be complete and the locomotive ready for inspection in a few weeks.

The enlargement of the field of operation of the Electric Storage Battery is attracting a great deal of attention from capitalists, and has led to heavy investment in the property. The stock advanced some 7 points in the week, touching 44. The publication by the ELECTRICAL REVIEW of the fact that the Fourth avenue surface line owners are about to try the battery with a view of its adoption on that system, as well as the Second avenue, was, in fact, the cause of the buying. It would seem that up to date developments have been discounted as the stock has advanced sharply. The company by the way has entered the South American field by making a contract with the Argentine Republic for light and power for the public buildings in Buenos Ayres.

Edison Electric Illuminating of New York advanced some 3 points, closing at 99. The new 5 per cent consolidated bonds sold at 103¼@ 103½.

The Edison Company of Brooklyn sold at 106 and the first mortgage bonds at 111¾. American Telegraph & Cable sold up 3 points to 99, which is the highest point of the year. There was some little activity in North American stock around 6 on favorable developments regarding the reorganization of the Milwaukee Street Railway property.

American Bell was strong on limited sales, opening in Boston at 195½, advancing to and closing at 197½.

Of the other stocks on that Exchange, Erie Telephone declined 4½ points to 53½; the stock does not sell ex-dividend until August 11. New England Telephone was steady at 87¾. The values of Westinghouse shares were not influenced by the deal with the Baldwin Locomotive Works. Prices were unchanged at 36½@37 for the common and 54@54½ for the preferred.

In a table following is given the regular monthly table of important telephone and electrical stocks, showing changes which occurred during July. The declines were very few and about one-third of the stocks recorded advances. The demand for this class of securities, barring some three or four which are active on the New York Stock Exchange, is restricted, and for this reason values do not fluctuate. The table follows:

	August 1.		July 1.	
TELEPHONE:	Bid.	Asked.	Bid.	Asked.
Bell	197½	206	....	202½
Bell of Mo.	175	185	175	185
Central Union	51½	....	51½	....
Chicago	166	175	166	175
Erie	57½	58	58¼	59
Hudson River	38	42	40	44
Missouri & Kansas	40	50	40	50
New England	88	....	75	76
New York & New Jersey	118	120	109	...
Providence	92	95	88	....
Southern New England	95	97	92	94
	August 1.		July 1.	
ELECTRIC:	Bid.	Asked.	Bid.	Asked.
Boston Illuminated	116	...	109	....
Bridgeport Electric	32	34	33¼	35
Edison Ill., Boston	137½	....	134	....
Edison Ill., Brooklyn	97	99½	108½	110½
Edison Ill., Philadelphia	....	115	....	119
El. Lt. & P. (Sun. Tran.)	93¾	93¾	91¼	91¾
Electric Storage	36¾	37	....	....
Fall River Electric	100	100	....	....
General Electric	36	36⅜	35¼	34¾
General Electric, Ptd.	69¾	70	70	71
Lowell Electric	94	96	91	94
Missouri Electric	....	100	....	100
Narragansett Electric	84¾	85¼	82	84
Salem Electric	101	102½	101	102½
United States Elec. Lt.	133¾	134½	134	135½
Woonsocket Electric	....	115	....	115

BAIN.

New York, August 10, 1895.

Westinghouse High-Tension Experiments.

The Westinghouse Electric and Manufacturing Company is reported to have completed apparatus for testing high-tension transmission, which will be sent to Denver for practical demonstration. It is stated that transmission at 50,000 volts will be attempted and that Mr. L. B. Stillwell, chief electrical engineer of the company, has already tested the apparatus with 60,000 volts. The object of the experiments is to find means for increasing the distance over which electric current can be profitably transmitted.

KIND WORDS.

"THE BEST OF THEM ALL."

TO THE EDITOR OF ELECTRICAL REVIEW:

I acknowledge the ELECTRICAL REVIEW to be the best of them all.

H. TERHUNE.

Middletown, N. Y., August 5, 1895.

"WORTH THE PRICE."

TO THE EDITOR OF ELECTRICAL REVIEW:

I always get the REVIEW from our newsdealer, but have trouble getting it in small places. However, it is worth the trouble and the price, as I have found it the best paper in the trade for a workingman who is anxious to learn and keep up with the myriad of new inventions.

W. M. LAMSON.

Mt. Savage, Md., August 4, 1895.

PERSONAL.

Mr. C. O. Baker, Jr., the well-known platinum refiner, returned last week from a brief respite at Lake George. He is now devoting his energies to arranging for another vacation, which will include Mr. Eugene F. Phillips's clambake at Providence next Saturday.

It is predicted in Philadelphia that Mr. J. R. Beetem, the recently appointed chief engineer and general manager of the People's Traction Company, will be made general manager of the Union Traction Company, which controls all the Philadelphia street railways.

We understand that another incandescent lamp manufacturing company will soon enter the field. It is the expressed intention of the gentlemen interested in the new enterprise to make nothing but high quality lamps at a fair price. If this policy is adhered to the company should be a success.

As announced in the ELECTRICAL REVIEW last week, the management of the Fourth avenue horse railway, in New York city, have determined to again try storage battery traction. This is the second time the same road has tried accumulators, the former experiment, which was made about six years ago with the Julien cell, being abandoned, chiefly on account of litigation. We believe that storage battery traction will be an ultimate success and the company which will make the present installation is perfectly competent to make the test thoroughly.

THE CAPACITY OF ELECTROLYTIC CONDENSERS.

BY SAMUEL SHELDON, H. W. LEITCH AND A. N. SHAW IN THE "PHYSICAL REVIEW."

INTRODUCTORY.

The phenomena of electrolytic polarization have long been known. Varley,* however, seems to have been the first to appreciate that an electrolytic cell, when subjected to small voltages, could be employed as a substitute for a condenser of great capacity. He made determinations† of the capacity of platinum plates in dilute H_2SO_4. About the same time Kohlrausch‡ determined the capacity of platinum electrodes, in order to find whether the error thus introduced, when these electrodes were employed in the measurements of the resistances of electrolytes according to his method, were negligible or not. (We might well call attention to the fact that Fessenden§ quite recently says that all measurements made by the Kohlrausch method are incorrect, because the impedance, and not resistance, is really measured. While this may be true in the abstract, only ordinary experimental precaution is necessary to make these two quantities practically the same. Kohlrausch‖ has recently shown the magnitude of these errors.) Blondlot* and Helmholtz† have worked upon the capacity of electrolytic condensers, but the original publications are rather inaccessible, and the abstracts by other authors are wanting in data expressed in absolute measure. During the progress of this investigation two papers have been published which have a direct bearing on the subject. One by Hopkinson,‡ Wilson and Lydall considers the capacity of electrolytic condensers when traversed by an alternating current; the other, by Bouty,§ considers the curves of the polarization of charge and discharge as functions of the time after closing or opening the circuit. Many others have worked upon the subject in its different aspects.

METHOD.

Many workers have assumed that a platinum H_2SO_4 cell, after being short-circuited for several hours, is in a neutral or unpolarized condition. This is not the case. We have not been able to obtain such a condition even after short-circuiting for days. Even new electrodes, which have never been in acid, exhibit marked polarization. To avoid the delay necessary to bring the electrodes into even an approximately neutral condition, we have had recourse to a method similar to the "method of reversals" employed in testing iron. A difference of potential, measured by a voltmeter, is impressed for a certain time upon a circuit containing the electrolytic cell in series with a non-inductive resistance equal in amount to the resistance of a ballastic galvanometer about to be used. By means of a commutator the polarity of the difference of potential is reversed and the galvanometer is substituted for the resistance. The throw of the galvanometer gives the quantity of electricity necessary to depolarize the cell from a given voltage to zero, plus the quantity necessary to polarize it to the same voltage in an opposite direction. These two quantities are equal. The capacity at that voltage is obtained by dividing half the quantity by the voltage. The method yields quick results, and any measurement may be repeated at will. The voltmeter employed was one of Weston's. The galvanometer was of the d'Arsonval type, with a complete period of 44 seconds, and a resistance of 1,065 ohms. The calibration of the galvanometer was obtained with the help of a Clark element and a standard microfarad condenser. The electrolytic condenser acts like an ordinary condenser of very large resistance as far as its effect upon the damping of the galvanometer is concerned. The electro-motive force set up in the moving coil is opposed by the impressed electro-motive force when the swing is in one direction, and by a counter electro-motive force of the cell when in the other direction. The resulting damping is the same as would occur on open circuit; *e. g.* the ratio of one amplitude to the following with the electrolytic condenser in circuit was 1.08; with open circuit, 1.08; with equal wire resistance substituted for the electrolytic condenser, 1.60.

We have also employed a method similar to the "step-by-step method" used in obtaining hysteresis curves of magnetic substances. The electrolytic condenser in series with a ballistic galvanometer is subjected to a voltage which is increased by steps from 0 to a maximum; reduced in a similar manner to 0; reversed and carried to a negative maximum and back to 0. The throws of the galvanometer accompanying each change of voltage are observed, and after algebraic summation, as in the magnetic method, are used as ordinates, with voltages as abscissæ.

The condensers with which we have done the greater part of our work are of two forms, represented respectively in Figs. 1 and 2. The electrodes in the first form were of platinum wire, sealed i to capillary glass tubes. The ends of the tubes were bent at right angles, as indicated in the figure, and together with the ends of the contained wires were ground plane and polished. The object in bending the tubes at right angles was to obtain uniform current density—a needless precaution, as explained later. The electrodes, together with a thermometer, were mounted in a cork which fitted in the top of a beaker containing a 1:20 solution of H_2SO_4. We have used four such cells with wires of .514 mm. diameter, and four of .41 mm. diameter. The condensers of the second form (Fig. 2) were made from glass tubing 3.2 mm. internal diameter, bent in the form indicated. The electrodes are mercury and the electrolyte dilute H_2SO_4. The condenser consists of several cells placed in series, and the mercury portions which fill the lower bends act as cathodes on one side and anodes on the other. We met with some difficulty in endeavoring to properly dispose of the mercury and acid to the exclusion of air bubbles, but overcame this by employing a force pump. One end of the empty tube was passed through one of two perforations in a rubber stopper which was fitted into a test tube containing equal parts of mercury and dilute acid. Through the other perforation passed a tube connected with the force pump. By slightly tipping the condenser tube its end could be brought at will into either mercury or acid. Then, by manipulating the force pump, any desired volume of acid or mercury could be forced into it.

* Patent Specification, C. F. Varley, Electric Telegraphs, etc., January, 1860.
† Varley, Phil. Trans., 161, p. 129, 1872.
‡ F. Kohlrausch, Nachr. der K., Gött Gesellsch., September, 1872, p. 453.
§ Fessenden, Phil. Mag., December, 1894.
‖ Kohlrausch, Annalen der Phys. u. Chem., Band 49, 1893, p. 235.
* Blondlot, Thèse de Docteur, Nr 460. Paris, 1881.
† Wiedemann, Lehre der Elek., Vol. II, p. 451.
‡ Proc. Royal Society, Vol. LIV, p. 407.
§ M. E. Bouty, *Journal de Physique*, November, 1894, p. 498.

EFFECT OF ELECTRO-MOTIVE FORCE ON CAPACITY.

If we consider the capacity, C, of an electrolytic cell to be the ratio of the quantity of electricity, Q, passed through it to the electro-motive force of polarization, p, produced, it is evident that the capacity cannot be constant; for p has a maximum limit, and if an electro-motive force greater than this limit be impressed on the cell a current will flow and C becomes infinite. For very small values of p, C has a definite value, which has been termed by Blondlot the "initial capacity."

The following* have been given as the maximum limits of p for platinum electrodes in dilute H_2SO_4:

Observer.	Maximum p in Volts.
Wheatstone	2.56
Buff	2.82
Svanberg	2.54
Poggendorff	2.56
	2.62

Fromme† states that maximum p varies from 1.45 to 4.31 volts, according to size of electrodes and concentration of electrolyte.

The capacity of a cell varies, then, between its initial value at a low voltage and ∞ at 2.62 volts. The manner in which it varies is represented by the curve in Fig. 3, which was obtained from a cell of the form shown in Fig. 1. The cause of the curvature is undoubtedly what Bouty‡ has termed the "force of depolarization," which he shows increases with p.

EFFECT OF ELECTRODE SURFACE.

If the two electrodes of a cell expose to the electrolyte areas of S_1 and S_2 cm.$_2$ respectively, then the initial capacity C of the cell is obtained from the formula

$$\frac{1}{C}=\frac{1}{K}\left(\frac{1}{S_1}+\frac{1}{S_2}\right)$$

where K is a constant depending upon the material of the electrodes, the character and temperature of the electrolyte. Bouty has shown that the manner of distribution of S_1 and S_2 is of no consequence. If *e. g.*, the electrodes were two plates placed parallel and opposite to each other, the current density on the opposed surfaces would be much greater than on the reverse sides, and although the polarization might attain for an instant a greater value on these surfaces, local currents would soon equalize it throughout the electrodes.

The values of K vary widely with different specimens of platinum. The following values for platinum in dilute H_2SO_4 are taken from Wiedemann. Blondlot observed that K sunk to about one-quarter of the given value after long standing in the electrolyte. Bouty gives K=20.13 for platinum in nitrate of soda. We have found for four cells, of the form shown in Fig. 1, with electrodes made from

Observer.	K in Microfarads.
Blondlot	31
Kohlrausch	25.8
Varley	(50)
Helmholtz	39
Colley	314 to 284

the same piece of wire, fused in the same kind of glass and used in dilute acid from a common source, the values of K at 20° to be 174, 180,464, and 656 microfarads, respectively. Also for two electrodes of platinum foil 7×0.5 cm., fastened by means of heated shellac to two flat pieces of vulcanite, so as to expose one surface only to the action of the current, K=43.2 at 20°. Again, for two like electrodes of platinum wire of .0107 cm. diameter and 5.8 cm. length, K=42.6 at 21.7°. The very high values for the first four cells we were prone to discredit, but continued redeterminations and recalculations yielded concordant results.

In the case of the mercury electrodes (Fig. 2) it is impossible to estimate with any accuracy the area of surface exposed to the electrolyte. The internal diameter of the tubes was 0.32 cm., and the initial capacity of 14 cells in series was 4.14 microfarads at 20°. Assuming all cells to be alike, each would have a capacity of 58 microfarads. Assuming the exposed surface of each electrode to be 0.15 cm.$_2$, gives K=675.

EFFECT OF TEMPERATURE.

The effect of temperature on the capacity is very marked. If C_{18} represents the initial capacity of a $Pt—H_2SO_4$ cell at 18°, then the capacity C at any temperature t is represented by the formula

$$C=C_{18}[1+(t—18)0.0215].$$

We have obtained this formula from the following observations:

Temp.	C.
17.66	1.60
24.36	1.80
28.16	1.93
33.26	2.14
39.96	2.38

The cell was placed in a water-bath whose temperature could be changed. The temperature of the electrolyte was read from a thermometer, whose bulb was in the cell and near to the electrodes. The electrolyte was not stirred for fear of introducing air.

The $Hg—H_2SO_4$ cells showed a larger temperature co efficient. They were placed in a large water-bath, and the temperature of this was obtained by averaging the readings from several thermometers, placed at various points near the cells. The following are the observations:

Temperature	13.5	21.4	30.4	35.3	40.0	45.97
Microfarads	3.29	4.29	5.70	6.70	7.55	8.88

These results plotted as a curve show an increase in capacity of about 4 per cent for each degree of rise in the neighborhood of 18°.

EFFECT OF CONCENTRATION.

Changes in the concentration of the electrolyte do not have a very great influence on the capacity. This is shown by the following observations, taken at a constant voltage (0.1808 volts) with the same pair of electrodes:

Volume of Solution. Volume Acid.	Capacity in Microfarads.	Temp.
3	.376	20.06
6	.387	20.01
12	.400	20.26
24	.404	20.16
48	.450	20.25
96	.465	20.16
192	.491	20.26

COUPLING OF CELLS.

If any number of cells be joined in *multiple arc*, the capacity of the combination is equal to the sum of the capacities of the individual cells. This natural conclusion we have verified by experiment.

If any number of cells, of capacities, C_1, C_2, C_n, be joined in *series*, the capacity of the combination C can be obtained from the formula:

$$\frac{I}{C}=\frac{I}{C_1}+\frac{I}{C_2}+\cdots\frac{I}{C_n}.$$

Inasmuch as C_1, C_2 and C_n vary with the voltage, if cells of different individual capacities be joined in series, the capacity of the combination can be found only by constructing a derived curve from the curves of the separate cells. The manner of doing this may be illustrated by the following example, taken from our observations:

CELL NO. 1.

Volts	.18	.36	.58	.64
Microcoulombs	.069	.204	.618	.83

CELL NO. 2.

Volts	.090	.18	.29	.319
Microcoulombs	.049	.154	.575	.798

Plotting two curves with microcoulombs for ordinates and volts for abscissæ (Fig. 4), determine from them the voltages of polarization produced in each cell by the passage of different quantities. We have

Microcoulombs....	.1	.2	.4	.6	.8
Polarization of No.1	.246	.350	.490	.575	.630
Polarization of No 2	.146	.210	.266	.299	.319
	.392	.560	.756	.874	.945

From the sums of these voltages construct a new curve, which will represent the relation between volts and quantity which exists for the combination.

The following are the observed values for the cells No. 1 and No. 2 in series:

CELLS IN SERIES.

Volts.....	.27	.54	.87	1.01
Microcoulombs.	.0595	.187	.573	.917

These values, marked + in the figure, are seen to correspond with the calculated curve.

As the capacities of the cells at any voltage are equal to the slopes of their curves at this voltage, it will be seen that, although the capacity of a series combination is smaller than that of the individual elements, it may be considered as constant over a much wider range of voltage.

DISSIPATION OF CHARGE.

The efficiency of an electrolytic condenser cannot be very great, considering the efficiency to be the ratio of the energy of discharge to that of charge. By the step-by-step method we have taken a great number of curves showing the dissipation when the voltage is passed through a cycle. These are very similar to hysteresis curves. We will give but two of these curves. The first (Fig. 5) was taken from two $Pt—H_2SO_4$ cells in series, which were as nearly depolarized at the start as any which we were able to get. The second (Fig. 6) was taken with the $Hg—H_2SO_4$ tubes strongly polarized originally. The method of observing, in each case, was to close the circuit under a given voltage for 11 seconds, until the galvanometer throw could be observed, open the circuit for 49 seconds, then close again under the voltage of the next step. The cell was thus on open circuit 49 seconds for each step. (This time was necessary in order to bring the galvanometer needle to rest.) We have increased this time of open circuit in different sets of observations on the same cell, but find little change in size or shape of the curves. Hopkinson has obtained by calculation curves of the same general shape where an alternating voltage was applied and 100 cycles were passed through in a second. The ends of his curves, however, meet. We have been unable to make any of ours do so, and are unable to account for it. We are almost certain that it is not owing to original polarization, to change of temperature during the cycle, to error in the voltage, or to variation of the time of keeping the circuit closed or open at the different steps.

Looking at Fig. 5 it will be observed that the greatest value of q does not correspond to the highest voltage, but to a descending voltage two steps lower. This shows us that in this case the polarization falls on open circuit by an amount greater than the difference between two consecutive steps.

The energy expended by the external voltage during the first half cycle,

$$E=\int vdq,$$

is represented by the area OABC. The energy returned by the cell equals the area BCD. The ratio of the latter to the former is very small. In the case of the $Hg—H_2SO_4$ cells the efficiency is even lower. The rapid cycles taken by Hopkinson are of the same shape and show equally low efficiency.

In conclusion, we may add that an electrolytic condenser is unsuitable for annulling ferric inductances. While by the adjustment of a proper number of cells in series the capacity might be made to rise with the current in nearly the same manner as the inductance (a thing not true of ordinary condensers), there would be a wide divergence when the current was decreasing. The capacity for decreasing current (slope of curve of quantity and volts) is much less than for increasing. The ferric inductance, owing to hysteresis, is larger on the decrease. Again, the high temperature coefficient and low efficiency are prohibitive to practical usage.

The Bryant Marine Switch.

It is often necessary in special installations that an extra durable and strong device is required. This was especially so in the case of the two steamers, "St. Paul" and "St. Louis," and the Bryant Electric Company, of Bridgeport, Conn., designed a marine switch which was used on these vessels.

This switch consists of a single-pole switch incased in a metal box and mounted on a porcelain base,

NEW BRYANT SWITCH.

holes in the box for the entrance of the wires being protected by porcelain or hard rubber bushings. The box is covered, with the handle projecting. A good idea of the appearance may be gained from the accompanying illustration. The Bryant company also placed a number of black china switches in each vessel.

Grier Brothers, managers of the Bryant Electric Campany's western office, keep these switches in stock in their warerooms in Chicago.

* Wiedemann, Lehre von der Elek., Vol. 2, p. 695. The assumption is made that electro-motive force of Daniell cell = 1.1 volt.
† Annalen d. Physik u. Chemie, XXXIII, p. 80.
‡ Bouty, l. c., p. 505.

ELECTRIC LIGHT FLASHES.

Work on the electric lighting plant at Sterling, Ill., is advancing rapidly.

Work has been resumed on the Morrisville, N. Y., electric light plant.

St. Ignace, Mich., will build a municipal incandescent lighting plant.

Work on the new electric lighting station at Illiopolis, Ill., will soon begin.

There is considerable agitation in favor of a municipal lighting plant at Rockford, Ill.

The Citizens' Electric Light Company, of Salt Lake City, has received six car loads of machinery for its new plant.

The Citizens' Electric Light Company, Appleton, Wis., has installed a new 225 horse-power engine, and will improve its service.

The number of central stations in France for the distribution of electrical energy was 328 on January 1, 1895, Paris not included.

Bids have been received and opened for the construction of the building which will cover the municipal electric light plant at Chicopee, Mass.

City Engineer Benzenberg refuses to be placed in the light of advocating a municipal electric lighting plant for the city of Milwaukee, Wis.

It is expected that the electric light plant at Mound City, Mo., will be ready for operation on September 1, which will be made a gala day.

The fly-wheel at the Westbrook, Mass., station burst on August 5 and did a great deal of damage to the building and plant. Nobody was injured.

The Kearney, N. J., Electric Lighting Company is stringing some new lines which have been repeatedly cut. The police are trying to find the vandals.

Union City, Mich., has accepted its municipal electric light plant, and now the property owners are engaged in figuring out just how much additional taxes they will have to pay.

The earnings of the Edison Electric Illuminating Company of New York for July are as follows:

	1895.	1894.	Increase.
Gross, July.....	$124,181.24	$108 014.40	$16,166.84
Net, July.....	56,344.32	45,428.21	10,916.11
Gross, 7 months.	1,071,626.30	933,352.83	138,275.47
Net, 7 months...	531,240.01	455,067.57	76,172.44

The Citizens' Electric Light Company, of Plainfield, N. J., recently organized in Union County, has purchased the plant of the Edison Electric Light Company, in the borough of North Plainfield, and will abandon it. The Citizens' company intends to light both the city and borough from the city plant.

Friday, July 25, was a grand *fête* day for the guests at Hotel Look Off, Lisbon, Vt., given to celebrate the installation of the new electric light plant which was put in by A. B. Noyes & Company, of St. Johnsbury. The plant has over 500 incandescent lights and 16 arc lights and is the largest electric plant in the White Mountains.

At their recent annual meeting in Detroit the stockholders of the Peninsular Electric Light Company elected the following officers: Ronald T. McDonald, president; James L. Edson, vice-president; Peter A. Hinds, secretary and treasurer. Directors, R. T. McDonald, Jas. L. Edson, E. J. Hathome, Robert S. Taylor, P. A. Hinds.

The Common Council of West Bay City, Mich., has directed the recorder to notify the local electric light company to stop lighting the streets. This is the result of a fight between the company and the council. The latter offers $75 a year per light, while the company wants $85. The city will remain in darkness until one side or the other gives in.

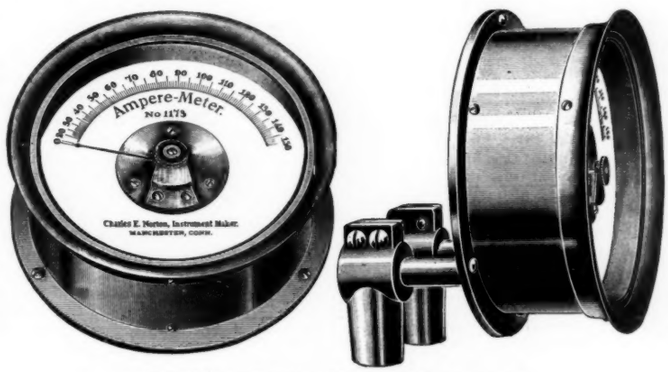
The heirs of George P. Ganster, deceased, have brought suit against the Metropolitan Electric Light Company, of Reading, Pa., to recover damages. The cause of action, as stated, is that the Exchange Hotel, belonging to them and adjoining the defendant company's plant, is rendered uninhabitable and untenantable, owing to the defendant company's engines, which, it is alleged, cause excessive noise and vibration.

The Edison Electric Illuminating Company of Altoona, Pa., E. B. Greene, superintendent, has awarded the following contracts for the new power house and apparatus: Building to W. V. Hughes, of Altoona, Pa.; engines to the Ball & Wood Company, of New York; boilers to Edge Moor Iron Company, of Wilmington, Delaware; dynamos to Pennsylvania General Electric Company, Philadelphia; self-supporting stack to the Edge Moor Iron Company, of Wilmington, Delaware.

The latest electrical snake story comes from Rochester, Pa., where a horse snake four feet two inches long was caught. It was taken to an electric light station and there a wire was attached to its mouth and another to its tail. A heavy current was then turned on. The snake twisted and turned and stretched out stiffly. The chief electrician said it was dead and ordered the current turned off. The apparently dead snake was then placed in a sunny spot, when, to the surprise of the spectators, it revived and began to crawl off. It was again caught and the electric current was again applied, but with the same results. Finally the snake was killed, in the old-fashioned way, with a club.

The Badger Illuminating Company is now furnishing Milwaukee, Wis., with 954 street lights. It is upon this basis that bidders must place their figures when they bid for the new contract which is soon to be let. Bidders will be required to give a $50,000 bond when they bid, and on receiving the contract they must give a bond in the amount of the contract for the faithful performance of the work. If the bid should be $100 per lamp per year and a 10-year contract should be let it will require a bond of $954,000.

Dating from August 1, the Capital Gas Company, of Sacramento, Cal., made reductions of from 25 to 40 per cent in the prices of gas and electric light. This was caused, it is stated, by the successful transmission of current from Folsom to Sacramento, where 10,000 horse-power is in daily use. Among other large consumers the Folsom line supplies the Southern Pacific Railroad shops with 3,200 horse-power for driving electric motors. A number of large flouring mills take the current and one brewery uses 700 horse-power.



NEW DIRECT-CURRENT MEASURING INSTRUMENTS.

New Direct-Current Measuring Instruments.

The accompanying illustrations show the ammeter and voltmeter which have recently been brought out by Charles E. Norton, Manchester, Conn., to supply the demand for a switchboard instrument combining accuracy with durability and symmetry of form. The instruments are calibrated with great care, and the scale divisions are widest where most used, so as to give the greatest possible deflection for given change of current, also making the divisions clear and large and easily discernible at a distance. They will remain in circuit constantly, it is claimed, without showing a heating error.

Thomas A. Edison is said to be writing a novel, according to a contemporary. This is somewhat disappointing, as the public naturally expects him to invent a machine to do it for him.

Patent Office Report.

Commissioner of Patents John S. Seymour on August 6 submitted to the Secretary of the Interior a summary of his report for the fiscal year ended June 30, 1895.

It shows that during that time there were 36,973 applications for patents received, 1,453 applications for designs, 77 applications for reissues, 2,314 caveats, 2,183 applications for trade-marks, and 318 applications for labels. There were 29,745 patents granted, including re-issues and designs; 1,804 trade-marks registered, and six prints registered. The number of patents which expired was 12,906. Allowed applications which were forfeited for non-payment of the final fees were 3,208.

The total expenditures for the year were $1,195,557; the receipts over expenditures, $157,390, and the total receipts over expenditures to date to the credit of the Patent Office in the Treasury of the United States, $4,566,757.

Commissioner Seymour states that in the last week in June, 1895, all but one out of the 34 divisions of the office had the work up to within one month of date, and the remaining division was between one and two months from date. At the close of the fiscal year there were 4,927 applications awaiting action on the part of the office.

Dr. Herz's Telegraph Invention.

A cable dispatch from London, under date of August 3, was published in the New York *Herald*, as follows:

In an interview with Dr. Cornelius Herz, at Bournemouth, the doctor, who is worn with anxiety and pain and is clearly dying, declared in broken utterances that he would leave a great invention to be patented and developed. The gist of the invention is an enormous improvement in telegraphy, by which more than 1,000 words can be transmitted by long submarine cables in the same time that 20 words can be sent now.

The invention, the doctor claimed, would allow of cabling 50 words at a cost of five cents. He dwelt upon the influence that the invention would have upon the newspaper of the future, and said that he intended, in granting royalties, to reserve all rights as far as they applied to news. The invention, he said, would render submarine telephony and multiplex telephony feasible. Among those engaged in his laboratories in France on the experiments which have resulted in the invention he mentioned Edison's nephew.

Mr. Edison informs the ELECTRICAL REVIEW that the statement that a nephew of his is working with Dr. Herz is incorrect.

American Electro-Therapeutic Association.

The American Electro-Therapeutic Association will hold its fifth annual meeting at the College of Physicians and Surgeons of Ontario, in Toronto, Canada, on Tuesday, Wednesday and Thursday, September 3, 4 and 5, 1895. Dr. Emil Heuel, 352 Willis avenue, New York city, is secretary of the association.

Technical Research.

Every engineer is engaged in technical research, sometimes at his own expense, but oftener at the expense of his clients, says London *Engineering*. The more important and commanding his position the greater is the proportion of his work that lies outside the boundary of assured knowledge. The ordinary everyday problems in construction are confided to the journeymen of the craft, who, out of the records of their experience, can generally find a fitting solution, or can even go one step in advance of what has been done before. But when not one, but many, stages have to be traveled into the unknown, there is needed something more than a general knowledge of the subject and fair ability to reason by induction. Then it is that the real art of the engineer—an instinctive power in adapting the forces of nature to new ends—comes into play. If the matter be one dealing with machinery, it is generally possible to try small-scale experiments in regard to a few, if not all, of the points of issue, and thus to eliminate some of the doubtful points in the subject. But there are many matters that are submitted to engineers, the difficulty of which arises mainly from their magnitude, and which have to be treated entirely from a new standpoint. Only full-sized experiments would be of use, and therefore the whole affair becomes a gigantic piece of research work, for which the promoters find the funds, and on which the engineer stands to gain or lose reputation. Generally he gains it. It is perfectly wonderful with what a large measure of success new and difficult work is accomplished, and how exceedingly few are the serious failures. The mishaps that do occur are mostly connected with details that could be studied on a small scale if the engineer had time and money to investigate them. But while promoters will risk tens of thousands of pounds on a project, it is practically impossible to get them to provide a few thousands to be spent solely in acquiring knowledge on points that are apparently of subsidiary importance. They consider that technical research is no part of their business, and they decline to spend money in increasing the general stock of knowledge, although the first fruits would be reaped by themselves.

Great advances in engineering practice wait more often upon details than upon principles. The conception of the compound marine engine is old enough, but it was not until a satisfactory surface condenser was produced that it became commercially possible. As long as the boiler was fed direct from the sea 30 pounds per square inch was the limit of practicable pressure, and compounding offered no advantage under this condition. The surface condenser, as now made, is a simple enough affair, yet it took many years to arrive at, because neither marine engineers nor ship-owners were willing to spend the necessary money over a series of comparative experiments. Occasionally a sanguine individual ventured to try one, and when he found it unsatisfactory he generally preferred to face the known loss of abandoning it rather than enter into a series of experiments to perfect it. The triple-expansion marine engine furnishes another example. Up to about 1881 there was scarcely an engine of this kind constructed, and after that date there were very few built of any other kind. The deterrent cause in this case was a misgiving as to the possibility of finding a satisfactory material for boilers carrying 160-pound to 180-pound pressure and complying with the requirements of marine service. Ship owners held back from making experiments for the benefit of the trade. For years they stuck to the compound engine, well knowing that a 20 per cent economy was available, if only certain preliminary difficulties, by no means insuperable, could be overcome. But, naturally, no one was willing to pay for experience that would be immediately public property.

It is only under the protection of a patent that a manufacturer can afford to institute researches and pay the cost of experiments. It is a matter of common knowledge that some subjects which it would be advantageous to the public to have pursued, are allowed to sleep because it is known to be impossible to secure a broad patent for any improvements that may be devised in connection with them. In years past attempts have been made to discover the best methods of bringing certain processes or materials into practical use, and although success has not been attained, yet the way has been so far pointed out that it is hopeless to try and discover an entirely new means of attaining the end. The solution is a matter of degree rather than of principle, and as such does not lend itself to be secured under the provisions of the patent law. Superheating furnishes a case in point. It is generally believed that we are on the verge of a revival of superheating, and that it will be successful. But in years past there was a very determined attempt to use superheated steam. Apparatus was fitted in a large number of instances, particularly on board ship, and after extended trial was abandoned for several reasons. First and foremost, there was the difficulty of finding a lubricant that would not decompose under the influence of very hot steam. The introduction of mineral oils and vaseline has removed that source of failure without any effort on the part of mechanics. Then there was the chance of the superheater becoming incrusted with salt carried over from the boiler with priming water. But salt in boilers is, or should be, a thing of the past, now that evaporators are so common, and thus a second source of failure has disappeared. The other difficulties were chiefly mechanical, and individually were not serious. But, taken in the aggregate, they are fairly formidable, and it is certain that they will take some time and a liberal expenditure of money to entirely overcome. As our columns have shown, attempts are now being made on a practical scale to introduce superheating. The attitude of the profession is one of expectancy; the majority are waiting to appropriate the result of other people's experiments, certain that nothing can be discovered that will furnish grounds for anything but a narrow patent.

It would be possible to adduce examples in many other departments of engineering to show that science languishes and progress is delayed because our predecessors advanced far enough to demonstrate the principles on which we should act, and yet fell short of attaining a commercial success. The last step, which they failed to take, often from not having the requisite material available, is capable of many solutions, and, therefore, seldom can be made the subject of a paying patent. A man may devise half a dozen means of attaining the end, and may fancy that he has closed every avenue to his competitors; but no sooner has he published his plans than alternative methods, of which he never dreamed, start forth like the ghosts at Macbeth's banquet. The man of business acumen waits and lets other people make his experiments for him, relying on his commercial ability to secure a fair share of the results, even if he be a little late in getting a start.

There is, however, one class of men who find it to their interest to make experiments without the hope of direct gain. We refer to professors in technical colleges. They are very favorably circumstanced for making researches, in that a large amount of apparatus is at their disposal, and that they have, to some extent, at least, the command of funds for the purpose. Further, they generally have a considerable amount of leisure in the session, while the vacations are far in excess of what is necessary for physical and mental recuperation. They actually get more holiday than the school usher, who has not only to instruct his pupils, but who has also to undertake the formation of their characters and to join in their games. From morn till night, Sunday and weekday, the unfortunate assistant schoolmaster is boy-ridden. He eats with him, he walks with him, he plays with him, and often he sleeps with him. In spite of three intervals of rest per year, he grows narrow and petty, and his society is avoided by men of the world. But the professor is not subject to such contracting influences. He has his lectures to prepare and deliver, and then he is free. If he is to be something more than an animated text book—a retailer of other men's ideas—he must experiment to furnish himself with original matter, or at any rate with novel illustrations. Further, if he have ambitions beyond the teaching of youths, he must provide for a larger audience than that contained in his class-room. We once heard a civil servant say, "The way to make a reputation in the office is to make a reputation outside it," and that is true of others than those that work for the crown. The engineering professor, until he has made himself a name by original work, is like a figure set up in a fair for every clown, who has learned to chip and file, to have his fling at. He is a mark for the cheap gibe of the man who has never attempted enough to find the depths of his own ignorance. If he would meet the world with a smiling face, untouched by such petty annoyances, he must be sustained by the esteem of the profession. The only way to earn this is by practical work, either in the way of construction or of research. The former avenue is often closed, and even if it be open, it is difficult of entrance to a man who has a permanent engagement which cannot be set aside at will. But at research the professor is on his native heath, and the profession is deep in his debt for much valuable information that has been evolved by a great expenditure of time and thought. Possibly all of it is not immediately applicable in daily life, but that which cannot be used to-day will be available at some future time, as the scope of our knowledge increases. If the total amount of engineering data that has been evolved in scientific colleges and schools could be separated from that obtained from other sources, and presented to us in bulk, we should be amazed to find how great and wide-spreading it is.

The powers of the technical laboratory are, however, distinctly limited. Full-sized experiments are beyond its scope. If no other consideration intervenes, there is always expense to be considered. In spite of the constantly rising fees charged for tuition, educational establishments share in a marked degree in that "eternal want of pence" that troubles the greater part of humanity. The available funds have to be spread over the largest possible area, like boarding school butter. Investigations on a really large scale can, therefore, not be attempted. There is very little chance of getting these done elsewhere in a systematic manner if, as we have already pointed out, the results cannot be secured to the experimenter under the patent laws. One notable exception, however, is found in this country to this rule. We refer to the researches undertaken by the Institution of Mechanical Engineers. On these there have been spent hundreds—possibly thousands—of pounds, and the results have been freely given to the world. The researches made by the Institution on riveting, on friction, on steam engine economy, and on alloys, are splendid monuments of the large-mindedness of the Council. We know that certain Continental societies have carried out similar inquiries, but not, we believe, with the same completeness. It is doubtful if any private person could obtain similar results, since, were his purse ever so deep, he would not be able to command the harmonious and zealous assistance of a number of men of equal ability to those serving on the research committees. He could not offer them such an honorable position as that of being the chosen representatives of a large and influential professional body. He would be obliged to content himself with the services of one man of the first rank, assisted by others of less eminence.

It is strange that such a splendid example should be almost solitary. There is ample scope for other societies to undertake work of this kind without incurring the reproach of being imitators, or of trenching on each other's territory. Next to the necessary work of holding meetings and publishing their transactions, there is no purpose to which their funds could be applied so directly valuable to their members, and so remunerative to the profession. It is not necessary that a scientific body should have great accumulated resources. It is prudent, of course, to have something in hand to tide over a few years of bad trade, but that is quite a different matter to accumulating a vast estate. Engineers are not usually men with a long tale of ancestors, whose memory bids their descendants repay the benefits they inherit by making an ample provision for posterity. On the contrary, they have usually made their own way in the world, and are but little indebted to their forefathers. It is contrary to their instincts to make elaborate provision for those that will come after. If the next generation cannot maintain an institution for themselves in average times, they are not likely to derive much benefit from one existing on endowments. If a father have but a moderate sum to bestow on his family, it is far better that he should spend it in setting them up in life with all the advantages of education, rather than he should leave them in comparative ignorance with a limited fortune which is less than a competence.

On all sides we hear the cry for technical education. But if it be good for the youth to have knowledge gathered up for him, and carefully tabulated and codified, surely it is also advantageous for the grown man to have the knotty points of science unraveled for him, so that he may lay out his clients' money with advantage. Economists tell us that cheapening of production increases demand, and this does not apply only to manufactured goods. Scores of pieces of engineering construction are left unattempted because

it is known that the cost so often exceeds the estimate. The reason is that the engineer has not the necessary data to guide him, and has largely to guess at his figures. The capitalist naturally declines to pay for the necessary research, since it is not his business to instruct the profession he employs; the private engineer has neither the time nor the money to undertake it; the professor finds the means at his command inadequate for the task. And so matters stand still, waiting till the investing public forget the smart of their last loss and gather confidence for another plunge. In the meantime, the average technical society reads papers, distributes its sessional volumes and congratulates its members on their wealth. It is a pity it does not do something to enable them to increase their individual incomes, by enabling them to furnish positive categorical assurances to their clients as to the efficiency of their designs and the reliability of their estimates.

It is easy, we know, to raise a host of objections to research work being undertaken by societies. It may be suggested that some departments of the profession will be aided and others will be neglected; that the council will consider the needs of their own practices and neglect those of the rank and file; that reputations will be created at the general expense, and so on. It is so much easier and so much pleasanter to find objections than to undertake the work. But the fact remains that the Institution of Mechanical Engineers has now pursued its experiments for years on a very extensive and liberal scale, and that no complaints have been made. A large amount of most valuable information has been gained, and there is the prospect that more will be added. But, we ask, why should it be left to one society to furnish funds and time and labor for the entire profession? The possibility and success of these researches have been demonstrated, and it is time that other bodies undertook them as well.

How it Feels to be Struck by Lightning.

Signalman John Brieg, who was recently struck by lightning while at his post at the Adams and Sands streets station of the Brooklyn Elevated Railroad, thus described his sensations to a reporter:

"At each fresh flash of lightning a feeling of fear seemed to oppress me. Just as I was in the act of pressing the signal button, a red-hot shooting pain shot up my right arm and I dropped back in my chair. For just a second, although it seemed like an hour, pains, as if from red-hot needles, passed all through me. I didn't remember anything else until I found myself in my own bed at home. Except for a little weakness, I feel all right now."

An application was filed in the Circuit Court at St. Joseph, Mo., on August 6 for a receiver for the Citizens' Telephone Company, a company formed to oppose the old Missouri-Kansas Telephone Company. Mismanagement and fraud are charged and sensational developments are promised by the persons filing the application. The company was to have had its plant in operation by July 15, but was recently granted an extension of time by the City Council.

ELECTRICITY ON STEAM ROADS.

PRESS COMMENT ON THE WESTINGHOUSE-BALDWIN ALLIANCE.

[*From the New York Evening Post.*]

The industrial alliance, or combination, into which two great companies, the Westinghouse Electric Company, of Pittsburgh, and the Baldwin Locomotive Works, of Philadelphia, are reported to have entered, is very significant of impending revolution in the methods of transportation and travel. It seems to indicate that economies long anticipated in theory have been realized in part, and that our existing railroads will presently enter upon the great work of substituting stationary for movable sources of power. For this, after all, is what is involved in what is commonly spoken of as the substitution of electricity for steam. Really what is substituted is the stationary boiler and engine house for one that travels about on wheels. Instead of generating the power required to move every train of cars in immediate connection with that train, the power is to be generated at one spot and drawn off where and when it is wanted. Perhaps the time may come when our magnificent locomotives, the pride of our ablest mechanicians, will be contemplated by posterity as curious instances of misapplication of power and waste of fuel. Already, when we compare the noiseless flow of energy through a slender wire with the terrific waste of hurling through space a locomotive weighing 100 tons, we seem to feel that the old order must soon change. The possible economies in the wear of machinery and bridges and track are so great as to make it seem necessary that they should soon become practicable.

[*From the New York Sun.*]

The recent combination between the Westinghouse Electric Company and the Baldwin Locomotive Works, the largest in the world, affords a practical demonstration of the fact that the use of electricity as a motor in transportation is to be greatly increased and extended.

It means that in the judgment of the men best informed as to the subject the time has come when their business interests require that in the manufacture of engines they must make ready for the application of electricity instead of continuing their construction with reference to the employment of steam only. They foresee a revolution in railway locomotion as a consequence of the successful experiments with electric locomotives, and they are combining their resources to be prepared to meet the new and great demand it will create.

Thus the problem of the use of electricity for such a purpose may now be regarded as solved, after many years of experiment and investigation. The solution has opened up a new field for mechanical activity which the largest interests engaged in locomotive construction have speedily undertaken to cultivate. The managers of both the companies combined for that end declare that so far they have no expectation that steam will be supplanted by electricity on the great railway lines, but they recognize that the extensive use of electricity as an aid and supplement to steam has become inevitable; and they have united to assist in its forthcoming development by the more economical and improved manufacture of electrical locomotives. * * *

The two companies thus united for the improvement and more economical construction of the electric locomotive and for the supply of a great and wide demand for it, have a combined capital of about $20,000,000, and it is capital invested and managed by hardheaded and experienced men, expert in their knowledge and understanding of the subject of railway transportation and locomotion.

[*From the New York World.*]

Hardly has the steam locomotive been completed when it is old-fashioned. The Baldwin Locomotive Works pass over to the Westinghouse Electric Company. Fifty years from now steam will be as old-fashioned as a windmill is to-day.

["*Holland,*" *In the Philadelphia Press.*]

The Westinghouse company, by long experience, costly experiments and a perfect plant, have learned how in the best and most economical way to develop and apply electricity as a motive power. The Baldwins have been for many years the representative American manufacturers of locomotives. They understood to the finest, subtlest detail the relation, capacity and endurance of the various parts of the structure which, when combined, make a locomotive. They had always constructed these machines so that they might be used with steam as the power for driving them. They had, however, become very familiar with electricity as a manufacturing power, since they had used it for some time in their works. Great cranes operated by electricity in their yards will lift a locomotive and carry it from one place to another as gently and easily, apparently, as though it were a bale of feathers.

Therefore, when it became apparent that the railway managers were determined either to equip or to experiment with electricity as a motive power, it was seen that some broad, sufficient arrangement must be made by which it would be possible to meet the very great demand for electrically equipped locomotives. The Westinghouse people could not make locomotives with their present plant, nor could the Baldwin people make electric motors or the electric machinery with theirs, but, acting in union, each furnishing his respective product, it was possible by combination between these corporations speedily and economically to build and equip this new machine, which, before many months have passed, will probably be found extensively used upon American railways. That is the especial design of the combination.

[*From the Boston Transcript.*]

W. P. Updegraff, private secretary to George Westinghouse, Jr., in explaining the scope of affiliation of interests of the Westinghouse Electric Company and the Baldwin Locomotive Company, said: "The combination is to develop the possibilities of the Tesla motor as applied to the railway service. They intend to make it possible to run from New York to Pittsburgh in three hours. With the Tesla motor we are assured power to draw a car at the rate of 150 miles an hour or more. The only thing now is to get cars and car wheels that will stand the strain of traveling at that rate of speed. The Baldwin people assure us that this can be done."

[*From the Philadelphia Record.*]

The Baldwin-Westinghouse combination is the industrial event of the Nineteenth Century. The world has not yet fully comprehended the vast possibilities of electricity; but it has found that it is a very good thing, and worthy to be pushed along—as it will be at a great rate by the east and west flanks of Pennsylvania's mighty industrial army.

Bergmann Gas and Electric Fixture Company.

Paul Thompson, receiver for the Bergmann Gas and Electric Fixture Company, has filed a report, showing that he has realized on the assets of the company $17,040, which he has on hand. He states that he received claims against the company amounting to $928,106, of which he believes a sum of $185,931 to be a just and true claim.

The ELECTRICAL REVIEW is informed that this failure occurred nearly a year ago. The report of the receiver has now been filed according to law. Mr. S. Bergmann has had no connection with the company since the Winter of 1890, although his name appeared in the title of the company.

Proposed Kern River Power Transmission.

The Kern River & Los Angeles Electric Power Company, with a capital of $5,000,000, has been organized under the Arizona laws to build and operate an electric transmission plant on the Kern River, in the Sierra Nevada Mountains. It is proposed to transmit current a distance of 100 miles to Los Angeles, Cal. There are oil wells at Los Angeles which supply a crude fuel oil selling for from 45 to 60 cents a barrel, which is equal to coal at about $2 a ton. Considered only from its commercial side, the transmission of electric current 100 miles to a place with such cheap fuel would not seem advisable, to say the least.

We have received from General-Manager George N. Stone, of the City & Suburban Telegraph Association, the August, 1895, issue of the Cincinnati Bell Telephone Directory. Some of the house numbers in Cincinnati have been changed by the city engineer and Captain Stone is sending out neat blanks for subscribers to fill in with their new addresses. The Cincinnati directory is one of the most conveniently arranged that we receive.

ELECTRICAL INTERFERENCE.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, CHICAGO, JULY 17, 1895, BY ARTHUR VAUGHAN ABBOTT, C. E.

(*Concluded from page 81.*)

If it be advanced that but little difficulty has so far been experienced from this cause the reply is, that electrical development has but just commenced and that inductive interference will rapidly multiply with the multiplication of disturbing plants. Further, in this country but little use has been made of alternating current distributions of magnitude, the most prolific source of inductive interference, but in Europe, where such installations are common, the difficulty has already been severely felt.

Inevitably, circuit containing the most sensitive receivers are the earliest and the keenest sufferers and the telephone and telegraph lines have, in instances, been paralyzed from such interference.

The simplest and surest relief is to separate the interfering circuits by such a distance as will render the inductive effect inappreciable. Unfortunately, induction is most powerfully manifested in crowded situations where there is the least choice of circuit location and the greatest multiplicity of conductors.

In electro-magnetic induction an actual current is set up in the neighboring conductors by the perturbing circuit. Plainly, if the disturbing circuit be so located with reference to other circuits as to enable the inducted waves to neutralize each other no trouble would be experienced. This is usually accomplished by frequently transposing the relative geometrical positions of the conductors, either by twisting them together as in a cable, or by placing them successively on different pins in pole line work. Either the perturbed, the perturbing circuit, or both, may be transposed with reference to each other, although the first expedient is the one usually adopted. The same results are attained by the use of concentric conductors for either, or both, of the circuits, for by this form of construction, theoretically the most perfect neutralization is secured.

As the disturbance due to electro-magnetic induction is owing to an actual flow of current, it is occasionally practicable to eliminate the difficulty by opening the disturbed circuit, either by a condenser or by the introduction of an impedance of such dimensions as will choke out the objectionable impulses, while permitting the desirable ones to pass. This method evidently requires a special design for each particular case and can only be indicated on general principles. When properly arranged, this plan is exceedingly successful, to such an extent that the practice of telegraphing and telephoning over the same wire, by the use of properly arranged condensers and impedance coils, is successively carried out.

b. Electro-static Induction — It occasionally happens, particularly in cases where a grounded circuit is adjacent to a metallic one, that cases of interference arise which cannot be explained upon any electro-magnetic theory, and which are not obviated by opening the disturbed circuit, either with a condenser or by an actual break in the same. These disturbances are now usually referred to as electro-static induction, in which the perturbed and perturbing circuits play the part of the two plates of a condenser with the air or the earth forming the di-electric. Interference of this kind is relatively quite rare and usually of so small an amount, at least with the transmission circuits now in operation, as to be perceptible only with the most delicate receiving mechanism, such as is found upon telephonic circuits. It is hardly probable that this form of interference will play an important part in any but telephonic installations, though here it is frequently the cause of considerable difficulty. This form of induction is the most difficult to cure, as neither impedance coils nor condensers have a marked effect as a remedy. The method of transposition also is comparatively inoperative, the only radical cure, apparently, being the removal of the interfering circuits to a considerable distance from each other. As this form of interference is not likely to be very widespread, and as it probably will not affect transmission plants to any great extent, it may be dismissed as of interest only to the telephonic fraternity.

Transmission plants, particularly those involving the use of large quantities of alternating current, are sure to multiply, in evidence of which, vide, the Niagara power plant. Already there is sufficient knowledge, if skillfully applied, to insure non-interfering circuit designs, the only way to secure a harmonic and capable transaction of electrical business.

3. Common Path Returns—When a single conductor is used in common on a portion of two or more circuits, more or less interference is inevitable. Many cases may occur where no objectionable results follow, as for instance in a common trolley wire jointly used by two electrical railways. In such instance the common use of the single conductor is a matter of agreement between the contracting parties, each of which endures for the sake of other considerations any resulting inconvenience, and no controversy as to mutual rights results. A single exception appears in the case of earth returns. In the early telegraphic days a complete metallic circuit was employed, but it was soon discovered that valuable economy in line construction could be effected by the use of the earth as half of the conducting circuit without any injury to the service.

The early telephone men graduated from the telegraph school, and consequently adhered to the same practice. Telephonic and telegraphic currents were so small that little or no interference resulted, excepting occasional troubles due to earth currents, for which nothing but a solar cyclone could be held responsible. With the advent of transmission plants incalculably larger amounts of electrical energy were dumped into the earth, that seeking a return by the path of least resistance buzzed and hummed through the unfortunate telephones and sounders in a way to drive the perplexed electricians distracted, to say nothing of the general public.

Early lighting plants attempted a grounded return with such inevitably uncertain service and loss of efficiency as to speedily drive them to a complete metallic circuit. At present electric railways are the only transmission plants of magnitude that have a ground return, unless the earthing of the neutral in multiple wire plants be included in this term. Against this use of the earth the telephone and telegraph made the bitterest of fights in early electric railway days and in every instance were defeated, and justly, the courts holding that no single enterprise could appropriate the globe as a return conductor to the exclusion of all others. The remedy for interference of this description is easy. Give every one a complete metallic circuit and all difficulty will immediately cease. Of course, the old bug-bear of prohibitive construction expense is immediately advanced, but this, like the "specter of the threshold," will disappear when boldly confronted. There are few electric railways, that by the improved conductance of a complete metallic circuit, would not annually save in coal more than the interest of the extra capital required in line construction. Quieter lines, freedom from errors and avoidance of repetitions would amply repay the telephonic subscriber for the slight increased cost of metallic circuits.

Transcontinental telegraph lines may, perhaps, continue on grounded return, as they would be placed under the heaviest expense and injured least by the absence of the metallic circuit. Each and every other electrical enterprise should be provided with its own individual and exclusive path as the surest, safest and, in the end, most remunerative method of construction.

4. Electrolytic Action—The last division of the subject is that which at present is causing the greatest annoyance and is likely to be followed by the gravest and most severe consequences. When the earth is employed to form a portion of an electric circuit, the current on entering the ground wanders off in all directions, seeking paths of the least resistance. Water courses, damp strata and the like are immediately charged, and, if there exists lines of water or gas pipe or other metallic structures of lower specific resistance than the earth, the current immediately seizes upon them as convenient and easy homeward routes. Were this the end of the process, but little objection would be raised, for it is doubtful if any underground structure could be so heavily charged as to become injurious merely by the presence of electrical energy, and the simple passage of the current through portions of city pipe lines could do no harm. Another set of objections, however, obtains, for under the circumstances described all the elements of an electrolytic cell exist, the metallic portions of the originating circuit forming the positive pole, the soil holding moisture and organic acids, the electrolyte, and the various underground metallic structures the negative poles. A study of the operations taking place in an electrolytic cell shows that the action of the current is such as to remove particles of metal from the negative pole, and to transfer them into the electrolyte, and ultimately carry them to the positive pole. Such a process as this inevitably results in the more or less speedy destruction of the negative element, and thus all transmission plants operated with a grounded return reproduce on a large scale the destructive conditions of the electrolytic cell, wherein the metallic structures in the ground play the part of positive and negative electrodes.

Electric railways, as the principal transmission plants adopting the grounded return, are the ones chiefly involved in this form of interference. So long as the various metallic structures in the street, owned by others than the electric railway company, are electro-negative to the railway circuit, the only effect to be produced will be the gradual deposition of metal from the railway circuit upon these structures, which probably would be the occasion of no injury whatsoever. The rails, rail bonds and return wires of the railway will inevitably suffer severely from corrosive influences, as has already been noted in many cases, but no actual interference can be alleged and the railway company must protect itself from destructive influences of this kind as best it may.

If any portion of other underground structures become electro-positive to the railway circuit, the current at this point leaves the pipe line or other metallic structure, and a lively corrosive action is immediately set up. In the case of water pipes, gas pipes, cable sheaths or similar metallic structures, the result is severe and destructive, putting the surface to such an extent that the pipe lines soon become leaky, the cable sheaths destroyed and the cables ruined. This effect has already attracted widespread attention by the magnitude of the injury which has been done in larger cities, such as Boston, Brooklyn, Rochester, Cincinnati, Omaha, San Francisco, etc. In every instance a careful electrical survey located and indicated the injury to be due to current introduced into the soil by the street railway that left the underground metallic structures at the various points where the injury was noted. The water pipe, gas pipe and other underground structures in our cities are too important and too necessary to be subjected to any possible destroying influence of this kind, and the effect of electrolytic action has been immediately to restrict the issuance of electrical railway franchises, and has operated as a severe check against the growth and extension of this branch of electrical industry. Two methods of remedy are proposed. The first and surest is the adoption of a double trolley system, by means of which the railway circuit is removed from the earth entirely, and exclusively placed upon its own and appropriate overhead lines. Where this means is adopted there can be no question either of corrosive action or any other interference from the railway circuit. In answer to this the statement will immediately be advanced that it is impracticable to operate an electric railway upon a double trolley system. This, however, is a fallacious argument. The double trolley was in operation previously to the adoption of the single trolley, and there is, therefore, no reason why it should not again come into practical operation.

For the single trolley two arguments may be advanced. The first and most important is that of decreased cost of construction secured by the use of the earth as a return circuit. So long as electrical railways were in their infancy, and the roads were small and used but a slight amount of electrical energy, the ground offered a convenient and appropriate return path. At present, with roads of magnitude, it is well understood that the ground cannot be relied upon as any adequate return, and that, from reasons of fuel economy only, an adequate metallic return circuit in the shape of ground feeds, or their equivalent, must be secured. It thus appears that the rails and the ground, under any circumstances, can only be utilized as a small fraction or portion of the return circuit. The argument of increased cost, therefore, can only be applied to small enterprises of this description. In such cases the amount of electricity dumped into the soil is probably not sufficient to do any great amount of damage, and, with appropriate rail bonds, the probable interference with other underground structures can be largely avoided. The other advantage

claimed for the single trolley system is the greater simplicity and cheapness of overhead construction and greater ease of maintaining same. This argument is of much greater importance than that of the decreased expense of the conductor circuit. The construction and operation of the double trolley road is decidedly more complicated than that of the single trolley. The present success of the electric railway is due largely to the constant and persevering expenditure of the best mechanical skill on the invention and reduction of practice of overhead appliances.

With the advent of the single trolley mechanical and electrical engineers were relieved from the necessity of improving the old and crude forms of double trolley systems and bringing them to a state of commercial perfection.

Now that electrolytic action rises to a point of supreme importance, and that railway companies are either likely to be deprived from extending their lines or laid under the penalty of the payment of heavy damages for injury to underground metallic structures, there is no doubt but that sufficient mechanical inventive skill will be quickly found to place the double trolley upon a perfectly successful and commercial basis.

Disastrous corrosive action occurs at points where the underground structures are electro-positive, the current at these locations leaving the pipe line for the earth. Mr. Farnham, electrician of the New England Telephone and Telegraph Company, of Boston, whose attention was early drawn to this matter, proposed as a remedy the careful location of the electro-positive points by means of a voltmeter survey, and then the attachment to the water pipes, cables and other metallic structure, of return conductors of such dimensions as should be fully capable of removing all current which tended to leave the metallic structures at the electro-positive point, thus transferring the action to the supplementary conductor that, if necessary, can be easily replaced. It is probably impossible to expect an immediate change to the double trolley, or the adoption of any conduit system which would necessitate the use of two conductors. Thus, for some time to come, the various underground structures in the city streets will be manaced from the presence of street railway currents, and as a protective measure a supplementary conductor attached to the electro-positive points may be introduced as a pallative, if not a complete, remedy. Inasmuch as street railway loading varies from time to time with the changes in the traffic on the system, it is necessary to keep a constant supervision over underground metallic structures, in order to see that they are constantly protected and that changes in the loading do not introduce additional points of danger.

Electrical interference is, therefore, no longer an inscrutable mystery, though doubtless the future will develop methods of correction far superior to those now in our possession. No interference problems are now likely to occur for which science, combined with an honorable recognition of the rights of others, does not suggest a remedy. In the past two decades electricity has permeated almost every industry, and the electrical engineer is now wellnigh indispensable to the design of all enterprises of magnitude. It only remains for the profession to establish such an *esprit du corps* as will always demand from each member an exhibition of the highest skill, fidelity and justice in the solution of each problem to place it in the foremost rank of scientific occupations.

Cotton States and International Exposition.

The Executive Committee of the New York Chamber of Commerce has accepted the invitation of the Exposition management to visit Atlanta, and has adopted strong resolutions endorsing the Exposition, and urging the representatives of New York commercial and industrial interests to avail themselves of the opportunity to make such exhibits as will be indicative of the resources and advantages of the State of New York, and urging the people of that State to visit the Exposition and take such interest in it as will demonstrate New York's feeling toward the South. It is probable that the Executive Committee of the New York Chamber of Commerce will visit Atlanta this month. Governor Morton has added Mrs. Samuel Spencer to the New York Commission, and she will take an active part in the preparation of the New York exhibit.

France will make a large exhibit of electrical instruments at the Cotton States and International Exposition at Atlanta, Ga.

Association of Edison Illuminating Companies.

The annual convention of the Association of Edison Illuminating Companies opened yesterday at the Hotel Cadillac, Detroit, Mich., and will continue through to-day and to-morrow. The papers read yesterday and those on the programme for to-day were all brief. To-morrow the delegates will be entertained by the Edison Illuminating Company of Detroit and the General Electric Company.

OBITUARY.

Hon. Hugh O'Brien, an officer and a director of the Boston Electric Light Company since its incorporation, died recently in Boston.

Edward C. F. Davis, president of the American Society of Mechanical Engineers, was killed by his horse falling on him in Central Park, New York, on August 6. He was 48 years old, and had been associated with a number of iron companies in an engineering capacity.

A Business Question on the Trolley Car.

At the corner of Fourth avenue and Smithfield street a lady from Glenwood entered a crowded outgoing car. The conductor knew who she was, and that she resided in Glenwood. He suspected that she had made a mistake and that she thought she was on a Second avenue car, so he crowded up the aisle and politely inquired :

"Where are you going, lady ?"

"That's my business," she tartly replied.

The conductor said nothing more, and the car sped along through the dark, crossing the Monongahela through the covered Tenth street bridge, and rapidly putting space between it and Glenwood. When it entered the big Knoxville incline elevator and stopped nobody said a word. After a minute's wait up the precipice it started, leaving the sparkling electric lights far below.

"My goodness!" screamed the Glenwood woman to the conductor, "where is this car going ?"

"That's my business," dryly replied the conductor. — *Pittsburgh Dispatch.*

Another Electrocution.

Richard Leach, a wife murderer, was executed by electricity on Monday morning at the Sing Sing, N. Y., prison. He received three shocks in all, varying from 1,700 to 300 volts, and was declared dead in four minutes.

American Electrical Works' Clambake.

August 17 is the date, Haute Rieve, near Providence, is the place, and here's the invitation :

1870-1895.

The pleasure of your company is requested at the observance of the twenty-fifth anniversary of the founding of the business of the American Electrical Works, of Providence, R. I., by our president, Eugene F. Phillips, and the 17th Annual Rhode Island Clam Dinner, tendered to the electrical fraternity, at Haute Rieve, Union Club Country House, Saturday, August 17. Lunch at 11.30. Bake opens at 2. Please reply.

William A. Hathaway, treasurer; William H. Sawyer, secretary; Charles R. Remington, Jr., assistant secretary.

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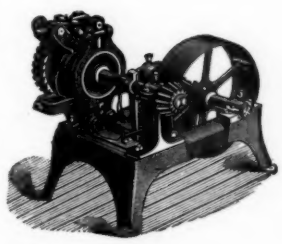
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ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Business Troubles.

ST. CLOUD, MINN.—St. Cloud Street Railway Company applied for a receiver. It has a capitalization of $225,000, including $100,000 bonds. This is equal to $33,000 a mile in a town of 6,000 population.

New Manufacturing Companies.

CHICAGO, ILL.—United States Electric Belt Company has been incorporated; capital stock, $10,000. Incorporators, J. H. Lee, Lute S. Alter and M. J. Frost.

CLEVELAND, OHIO.—Electric Boiler Renovating Company has been incorporated; capital stock, $25,000.

Increase of Capital Stock.

DENVER, COLO.—The Denver Consolidated Electric Company has increased its capital from $69,500 to $110,000.

Electric Light and Power.

SACRAMENTO, CAL.—The Power Development Company has been incorporated with a capital of $500,000. The directors are: Charles Webb Howard, E. W. Hopkins, C. N. Beal, Charles A. Grow and Albert Miller.

PETRERO, CAL.—Residents of this place are organizing to secure more electric lights and better water supply.

DES MOINES, IOWA.—A scheme has been formulated to consolidate the three electric light plants of this place, and to make E. G. Pratt manager.

DULUTH, MINN.—Capitalists have offered to purchase the electric light plant from the city at $60,000, and if the proposition is accepted, they will then put in a new set of gates at the dam, erect a new power house, and, with electric power generated from the water power, will operate the street railway, the city waterworks and the electric light plant.

EAST JEFFREY, N. H.—The Kimball Electric Company has received the contract to install a complete electric lighting plant for the Webster nail factory.

LISBON, N. H.—J. C. Atwood, of this place, has purchased the water power at the lower dam and will establish an electric lighting plant thereon.

KALAMAZOO, MICH.—G. Edwin Dunbar has purchased the plant of the city electric light company for $20,000.

LA PORTE CITY, IOWA.—La Porte City Electric Light and Water Company has been incorporated. The capital stock is $15,000. It is organized for the purpose of building, maintaining and owning electric lighting and waterworks in that town. The officers are: W. D. Wagoner, president; A. Van Valkenburg, secretary and treasurer. The directors are W. D. Wagoner, J. C. Graham, A. L. Walker, P. E. Wettstein, J. C. McGaheran, R. J. McQuilkin, E. Duke Naven, R. A. Perkins and S. A. Paige.

CASSOPOLIS, MICH.—People of this place are agitating the question of putting in an electric lighting plant.

SUSQUEHANNA, PA.—The Baptist church is to be equipped with electric lights.

New Telephone and Telegraph Companies.

HARTFORD, CONN.—The telephone line at Camp Coffin is to be rebuilt. The Southern New England Telephone Company will furnish the poles and instruments and the State the wire.

RED HOOK, N. Y.—This town is soon to be equipped with a telephone system. Peter H. Troy, W. D. Wilbur, J. Lewis Daly, Daniel O'Connell and John Troy are interested.

PUEBLO, COLO.—The Colorado Telephone Company will at once expend about $5,000 in improving their lines.

PORT JERVIS, N. Y.—The Sullivan County Telephone Company, of which G. Christian is president and Captain E. H. Pinney, secretary; Charles Homer, treasurer, is going to extend their line to Monticello. They have now a complete system in Liberty.

RACINE, WIS.—The Northwestern Telephone Electric Company is making an effort to secure a franchise here.

ELIZABETH, N. J.—The Elizabeth Mutual Telephone Company has been incorporated. The stockholders are 100 well-known citizens. The capital is $30,000.

MORRISON, ILL.—Whiteside Harrison Telephone Company has been incorporated. Capital stock, $6,000. Incorporators, Aaron D. Hill, Simon S. Crieder and John D. Hill.

AUSTIN, TEX.—The Gonzales Telephone Company, formed for the purpose of constructing and operating long-distance telephone lines to points in Gonzales, DeWitt, Lavaca, Victoria, San Patricio, Nueces, Bee, Karnes, Bexar, Hays, Fayette and other counties, has been incorporated; capital stock, $30,000. Incorporators, Leslie P. David, A. J. Moore, H. C. Kokernot and others.

WINTHROP, ME.—A branch telephone has been constructed from this place to Readfield, Kent's Hill and Mount Vernon. The line is a metallic circuit, equipped with long-distance telephones.

WINSTED, CONN.—The Southern New England Telephone Company is preparing to connect the towns of Granby, Canton, East Granby, Avon and the village of Tariffville with Simsbury, the above places forming the Simsbury exchange.

ROME, N. Y.—The telephone line between this city and the new Oneida County House, connecting with the Central New York Telephone and Telegraph Company's system, has been completed.

ANDERSONVILLE, OHIO.—An effort is being made to re-establish the old line to this place, and extend it on out to Yellowbud. The line is owned by private persons.

SANDY HILL, N. Y.—The Postal Telegraph company will soon open a telegraph office here to be in charge of A. D. Smalley & Company.

New Electric Railways.

AMHERST, N. B.—Rhodes, Curry & Company, of this place, have received a contract from the Halifax Electric Street Railway for 14 street cars and a $20,000 car house for the same company.

CHICAGO, ILL.—Evanston Electric Railway Company has been incorporated; capital stock, $200,000. To construct an electric street railway in Evanston. Incorporators, Andrew Crawford, Thos. G. Milsted and Parker Simmons.

ALBANY, N. Y.—Albany, Greenbush & Bath Railway has been incorporated to build and operate a street surface railroad for passengers, express and freight, to be operated by electricity or other power. The length of the railroad will be six miles, and the capital of the company will be $150,000. The directors are Edward J. Duggan, William E. Drislane, Edward J. McCaffrey, Patrick J. McArdle, Meyer S. Levy, Michael F. Cantwell, Albany; John F. Munger, East Albany; John F. Reilly, Greenbush; and Charles A. Bailey, Bath-on-the-Hudson.

JACKSONVILLE, FLA.—An electric railroad from this place to St Augustine will be in operation by the first of next January. It will be constructed by the Jacksonville & Tampa Bay Railroad Company.

BEATRICE, NEB.—The 50-year franchise and all personal property belonging to the Beatrice Rapid Transit and Power Company was sold at auction for $22,050 to Victor G. Lantry, of Omaha.

COVINGTON, KY.—An electric railway touching the principal points in Union, Wayne and Fayette counties will be built.

HARRISBURG, PA.—The Jenkintown & Fox Chase Electric Railway Company has been incorporated; capital stock, $20,000. The incorporators are Howard Fleck, Samuel L. Schively, James Satterthwaite, Thomas B. Payen, Howard Noble, of Jenkintown; and William P. Longstreth, of Fox Chase.

BOSTON, MASS.—The Interstate Consolidated Street Railway Company yesterday filed a petition for authority to issue bonds to the amount of $250,000 and stock to the amount of $400,000.

SUSQUEHANNA, PA.—Parties are figuring upon the cost of building an electric street railway between Susquehanna and the Delaware & Hudson station at Lanesboro.

AKRON, OHIO.—It is stated the electric railroad will be extended from this place to Doylestown, by way of Barberton and Wadsworth, and there is also a scheme to run an electric line from Massillon to Dalton by way of Brookfield and Greenville in Stark County.

FRANKLIN, PA.—The Franklin Terminal Railway Company has been incorporated for the purpose of constructing an electric railway. Address the secretary of the company.

ERIE, PA.—The Erie & Eastern Street Railway Company has been incorporated with a capital stock of $25,000.

TAMPA, FLA.—A company has been organized by Crosby Thompson, president; E. M. Hammond, vice-president; T. J. Appleyard, secretary and general manager; O. C. Ringle, treasurer; George H. Peckwood, land commissioner; for the purpose of building an electric railroad from Jacksonville to Tampa, Fla. Mr. Appleyard can be addressed for any information which may be desired.

NORFOLK, VA.—The Norfolk Albemarle & Atlantic Company, which is about 18 miles long, and extending from Norfolk to Virginia Beach, contemplates the idea of changing its road to standard gauge and placing motors upon it.

BIRMINGHAM, ALA.—The question of extending the North Birmingham electric line into the suburbs is being considered.

HILLSBORO, TEX.—The Hillsboro Street Railway Company have made arrangements to build.

HOLYOKE, MASS.—It is desirous to extend the street railway line to Mt. Holyoke college.

The Pennsylvania Street Railway Association.

The fourth annual meeting of the Pennsylvania Street Railway Association will be held at Wilkesbarre, September 4 and 5. The members of the association will convene on Wednesday, September 4, at 11 o'clock A. M., at which meeting the usual annual business of the association will be transacted including the election of officers of the association for the ensuing year. Papers on different subjects of interest to the members of the association will be read and discussed, and the general interests and welfare of street railways considered. There will also be an exhibition, in the large and commodious hall provided for that purpose, of street railway supplies by manufacturers and dealers, to an inspection of which the greater part of the next day will be devoted. Persons desiring to exhibit their supplies will write for space to John Graham, Esq., Wilkesbarre, Pa.

Thursday, September 5, will be devoted to an inspection of the exhibits of supply men, together with such entertainment as may be provided for the members of the association, including an excursion over the lines of the Wilkesbarre & Wyoming Valley Traction Company.

All street railway companies in the State of Pennsylvania, as also manufacturers and dealers in street railway supplies, who, by a recent amendment to the by-laws of the association, are eligible to associate membership, and all persons generally interested in promoting the interests of local rapid transit lines are not only invited, but earnestly requested to be present at the meeting and participate in its deliberations.

Those desiring membership, who have not already joined the association, can do so by sending the membership fee, $25, together with one year's annual dues, $10, to the secretary, S. P. Light, Lebanon, Pa. The advantages of co-operation by means of State organization are so well known to street railway interests that it is unnecessary to particularize them.

For further information, address JOHN A. RIGG, president; S. P. LIGHT, secretary, Lebanon, Pa.

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